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Galileo

MAGAZINE OF SCIENCE & FICTION



Lepton Power! • Speculations on
the Spirit • The World's Greatest
Non-Talent in SF • Part III of the
RINGWORLD ENGINEERS



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RE:THINGS

We never said it was going to be easy

Each year *Galileo* magazine presents a cash prize to the author of the best science fiction short story under 5000 words. We do this because we want to provide encouragement for the artform and because we want to publish good stories. The catch is that the only stories considered in the contest are those offered to *Galileo* for publication on our usual terms (first North American serial rights). The winning stories (first, second, and third places) receive cash prizes in addition to our regular payment.



ADVICE FROM THE EDITORS

The editors of *Galileo* Magazine are responsible for sending the entries of the finalists to Hal Clément for judging. We intend to send at least ten stories, but we will place among the finalists all the short stories we have received (between 2000 and 5000 words) which are written in a professional manner and achieve a synthesis of theme, plot, and characterization in a science fiction setting. Special attention those characteristics must put your entry among the finalists.

CONTEST RULES

Entries must be completely original, previously unpublished science fiction stories between 2000 and 5000 words. Manuscripts must be typed (clear photocopies are acceptable) and submitted by the author with a self-addressed stamped envelope and sufficient postage for the story's return. Entries must be received by December 31st in order to be considered for this year's prize. Winners will be announced in *Galileo* Magazine in the Spring of each year.

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Galileo

Magazine of Science and Fiction

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Editorial

Charles C. Ryan

SOMETIMES I wish we were in the insurance business. Certainly it would have been easy to clean up during the past six months. Even at ten bucks a policy, the ninnies who expected Skylab to fall on them could have made us millionaires a hundred times over. (A heck of a lot quicker than it could ever happen putting out a new science fiction magazine.)

All of which raises the spectre of this editorial. With our emphasis on a sanitized, money-back, guaranteed American lifestyle, most of us make Chicken Little look like a valorous Greek at Thermopylae. We panic at the hypothesis that our underarm deodorant might be depleting the ozone layer. We shriek in fear at the mere idea of a (barely) possible nuclear power plant accident. And, some are even suing their parents because they didn't turn out with the physique of Bruce Jenner, the brains of Thomas A. Edison, and the insight of Henry Thoreau.

Science and progress, of course, have become the biggest villains of all. They are responsible for these emotional catastrophes which are being unleashed upon us, aren't they? If we could just go back to the simple way we used to live, none of these problems would exist. Sure, and Santa Claus plays the bagpipe.

The simple fact is that more than half the people alive today wouldn't be if it weren't for science and progress. (For those ZPG folks who think that's not such a bad idea, gather all of your friends into a hall or closet—whatever is most appropriate—and eliminate half of them. It's not a decision you'll make lightly.)

Never mind the so-called "lack of confidence" politicians are mumbling about, what we really face today is a lack of courage. People are so used to having everything prepackaged and served up for them with little or no effort on their own part that they forget it used to be a struggle just to survive. If it weren't for

the thousands of creative scientists and the technicians who applied their work, we'd still be struggling today (not for a better job, more luxurious house, or status) just to put food on the table.

A history professor of mine once went into great detail enumerating the luxuries accumulated by royalty such as Louis XIV of France. He was King. He had it all. The freshest food, the most exquisite art, the largest palace, droves of servants—anything he wanted. Yet, most Americans have it better than he did.

Any child Louis XIV and his queen might have conceived had a *forty percent* chance of dying before the age of one. Of those who survived that first year, only the hardest reached the average life expectancy—which was twenty-five years of age in the late 1600's. Drinking water was polluted more often than not; there were tuberculosis bacilli in the milk; most of the food was contaminated and the only way to preserve it was with tons of salt. Few diseases were even identified, never mind curable, and if you were born far or near-sighted, you stayed that way. Though there was an emerging bourgeoisie, most people were either slaves or serfs and whatever they possessed was really owned by the king or his minions.

What changed it all? Science and progress, plain and simple. Democracy is a luxury (a vital one, no doubt) which arose from that science and progress, too. There had never been much of an opportunity for it to exist in human history because every spare moment was spent simply staying alive. And the means to that survival was usually controlled by someone else. The very literacy which allows you to read this editorial is an outgrowth of the industrial revolution which spawned the modern printing press and made it no longer necessary for each and every child to work alongside their parents in the fields.

Which brings me back to where I began. It is the fault of science that Skylab almost fell on us—or at least that's what many commentators would have us believe. Nuts. Sure, the exploration of space, like any other human endeavor, has its share of risks. But without such explorations—in space, in genetics, in physics, in chemistry and other sciences—we will begin slipping backwards. Technological advances allow as many as there are of us to live as well as we do. But you can't just stop and say, "We have enough." In almost the exact same way farmers have to turn mulch back into the soil to replenish it, scientists have to keep up theoretical research so those in the applied sciences can keep coming up with new and better gadgets that will keep us clothed, fed, educated and—yes—entertained. In essence, science is the seeking of knowledge solely for the understanding it brings. But when it comes down to brass tacks, even the

most improbable theoretical experiment or speculation eventually pays off in dividends unimaginable to us now.

If we want our children to inherit the legacy we possess; if we'd like our grandchildren to have it even better than we do; then now is not the time to falter; it is not the time to lose faith.

The Skylab hysteria, by the way, was predicated on the fact that statistically there was a slight chance that a piece of it would hit someone—a bit less likely than the chance someone might be hit by a meteorite this year. Think about it a minute. When was the last time someone you know was hit by a meteorite? How about someone you don't know?

Think about a few more things. By 1850, the average lifespan was 38.3 years and by 1900 only 16% of the children died in their first year of existence. About 50 years ago, the infant mortality rate had dropped to 7% and by 1977 only 4.7% failed to reach the age of one. Likewise, in the short 56 years from 1920 to 1976, the average life expectancy for all of us increased from 54 to 73 years. The decrease in infant mortality and the increase in life expectancy are directly the result of advances in science and technology.

One last thing to think about. Examine some of the simple, basic items around you. The shirt or blouse on your back for instance. Is it likely you would ever have realized that cotton, a fluffy weed growing in the fields, could be converted into thread and that clothing could be made from that filament? How about the material this is printed on? Would it have been within your imagination to take the pulp from trees and form it into paper? Perhaps you might have stumbled upon the processes for making cheese or butter from milk? No? Then don't you think it makes sense to let those capable of such thoughts have a free hand? Isn't it in our best interests to support them? Is it reasonable to let the Chicken Littles of the world subvert the future which might be ours if scientists can pursue their visions? And when scientists spin dreams of space exploration yielding riches even greater than those discovered by Columbus in the new world, will you stand in their way?

Some would. They are the same ones who promoted hysteria over the demise of Skylab instead of celebrating the tenth anniversary of the first moon landing. They would obscure the future with fear and steal it away from us. And they just may succeed because they are making more noise than we are.

The future, after all, belongs to those who work for it, to those who reach out and take it, to those who make the most noise. It is up to you to present a clear and loud voice for continued progress. Hop to it. Make noise—And a lot of it.

—G—

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Pro-File

Letty Hummel

*Larry Niven, Jerry Goodz, Geraldine Morse
Connie Willis, Robert L. Forward, Gerald Feinberg
Michael Sutch, Richard K. Lyon*



GALILEO ENDS its 1979 publishing year with a theme about beginnings and what lured our contributors in this issue to science fiction. For story writers and scientists alike it was often a matter of reading a magical story (three mention Heinlein) at a critical period (for most it was during adolescence). But, whether the first encounter came from an extraordinary book, the influence of a parent, or the appeal of a particular writer, they were, needless to say, all properly hooked.

A vorcomp and its human master struggle for survival in the *Jerry Goodz* story, "Keeper." An early Heinlein novel sparked his interest in science fiction and a personal note of encouragement from the late John Campbell, Jr. softened the blow of his first rejection and set him on his SF writing career. Mr. Goodz's livelihood has come from the electronic and aerospace industries and he is currently back in engineering air vehicles (Northrop's F-5 international fighter) where he got his early training. Since *Galileo* published his story, "Bolts" in issue #4, his writing time has been spent on novels—one (based on his efforts to re-write that first rejected story to please Campbell) is in the marketplace, one (based on "Bolts") is in final editing, and another is giving him "a very bad time getting started."

An incident in World War II gave Richard K. Lyon the idea for his story, "The Theft of the Great Pyramid." "My father," he says, "was in command of a remote Pacific Island and one day his bulldozer mysteriously disappeared." Making the literary transition from a missing bulldozer to a disappearing pyramid, Lyon uses some ingenious scientific speculation mingled with elements of mystery fiction to produce that novelty in SF literature—the short SF

detective story. A research scientist with Exxon and the inventor of a significant process for reducing air pollution, Mr. Lyon says his interest in science fiction comes from the influence of his father who was an avid SF fan. His most recent literary effort is a collaboration with Andy Offutt on *The War of the Wizards* series for Pocket Books. *Demon in the Mirror*, the first book of the trilogy, is now on the newsstands.

A volcanic wasteland on New California that houses a telepathic alien provides the setting for Michael Sutch's story, "Phantom's Hell." Currently working in a new field as a data processing analyst, Mr. Sutch says that picking up a copy of Robert Heinlein's *Citizen of the Galaxy* hooked him on SF. As a result, he says, "For years thereafter I read almost nothing else and God only knows how I managed to make it through high school." It is not surprising then that

Robert Heinlein and more recently, Roger Zelazny, are the writers who have influenced him most. He and his wife, Kathy, a microbiologist at the National Animal Disease Laboratory, live in Gilbert, Iowa. Mr. Sutch recently completed his first novel, a fantasy titled, *The Dead Dragon Quest*.

Much to the surprise of *Galileo's* editorial board, Connie Willis has coincidentally transformed into fiction what Robert Forward has given us as speculative science. As to her interest in SF, Ms. Willis, who calls herself one of the "Heinlein babies," says, "I read *Have Space Suit, Will Travel* at age 13 and still have trouble with all my characters sounding like Kip Russell. I also hit the early Nebula Award collections, apparently at a crucial time, because I keep trying to find some of the 'Pretty Maggie Moneyeyes' and 'Drowned Giant' kind of magic in what I read and, sometimes,

in what I write." We think Ms. Willis has indeed conjured magic in her story this issue, "Daisy, in the Sun." But, less our readers think we are biased judges, we offer an opinion by Ed Bryant (also featured in this issue's Star Chamber), a Nebula Award winner and founder of the Colorado Writer's Workshop of which Ms. Willis is a member, who has this to say: "I think "Daisy, in the Sun" is one of the best science fiction stories of the decade. It is a nearly seamless fusion of science and humanity. What Pam Zoline's "Heat Death of the Universe" was to the short SF of the 60s, "Daisy" is to the 70s."

Larry Niven's "The Ringworld Engineers" comes to its third episode in this issue of *Galileo*. In this next-to-last installment we find Louis Wu in one of those death-defying escapades that only the likes of Larry Niven can create. Mr. Niven's recent literary efforts include a collaboration with Steve Barnes on the story, "The Locusts" in *Analog*.

Except for a couple of book reviews, this is the first appearance of interviewer Geraldine Morse in the pages of *Galileo*. We have seen her around the office a number of times, however, because her husband, Floyd Kemske, is one of the staff members. Interviews are not her main business; she is a novelist primarily, having written a gothic which she is currently attempting to sell (and for which she has gotten some kind rejection letters). At this point, she is more than halfway finished writing her first science fiction novel, about which she declines to talk. She pays her bills by doing secretarial work at a contract research firm (which is sympathetic to the erratic hours of writers) and keeps her sanity by tending a mostly imaginary garden. What is it like to be married to a *Galileo* staff member? "Sometimes it's a lot like living alone."

She interviewed Vonda N. McIntyre at the offices of Houghton Mifflin, the day after the Nebula Award ceremony. Ms. McIntyre walked away from the ceremony with the award for the best novel (*Dreamsnake*), something which heartened her publisher since it was the company's first attempt to publish science fiction.

Imagine an energy source small enough to fit under the hood of a car and powerful enough to operate it for several years at a time. In "Lepton Power," Dr. Gerald Feinberg demonstrates that such a phenomenal energy device is just one of many applications that could result from developing an alternative energy source using the process known as "cold fusion." A physics professor at Columbia University, Dr. Feinberg's name is synonymous with the concept of "tachyons," a term he coined after recognizing that these faster-than-light particles can exist without violating the theory of

relativity. He's been an SF enthusiast since reading *Adventures in Time and Space* at 13 and Jack Williamson is the author he most enjoys reading. Science fiction, Dr. Feinberg says, has influenced him to "think about possibilities within science that I would not have imagined without it." Presently he is collaborating with bio-chemist Robert Shapiro on the book, *Beyond Earth Life*, about where and what kinds of life exist in the universe.

Dr. Robert L. Forward figures he has an ideal position as a Senior Research Scientist at Hughes Research Labs overlooking California's Malibu Beach. Some of the far-out ideas he dreams up have already become subjects for his research projects on gravitational mass sensors, laser propulsion, and electronic cooling; those that are too exotic even for the most advanced technology he writes up as speculative science articles. In

"Speculations on the Human Spirit" he presents the possibility that the religious idea of the human spirit can be explained by the scientific concept of subatomic patterns.

SF pioneer Charles D. Hornig offers us some reminiscences in this issue where he whimsically describes his experience in 1933 working for Hugo Gernsback as the 17-year-old managing editor of *Wonder Stories*. The candid humor of "The Greatest Non-Talent In Science Fiction" owes something to the unusual fact that Mr. Hornig is both the interviewer and interviewee of his piece. With the same playfulness that characterizes his interview with himself, Mr. Hornig tells us that he was born in Jersey City in 1916, but was "never raised except in *Poker*." A tax accountant now living in San Jose, California, he says he has studied such subjects as "psychology, philosophy, and time-lapse pornography."

—G



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Interview: Vonda McIntyre

Geraldine Morse

Fred Pohl presents 1979 Nebula Award to
Vonda N. McIntyre



HE SNAKE AND THE COW? Or, alternatively, *The Cow and the Snake*?

Don't both these titles have a ring to them more reminiscent of veterinary medicine than this year's Nebula award winner, *Dreamsnake*, one of the most popular science fiction novels of the past few years? And yet it seems scarcely more than chance that, given the words "cow" and "snake" and directed to build a story around them at the 1972 Seattle Clarion Writers Workshop, Vonda N. McIntyre rejected the picture of a boa constrictor locked in mortal combat with a hereford and arrived instead at her wonderful story about snakes and healing, "Of Mist, and Grass, and Sand," on which *Dreamsnake* was later based.

"Avram Davidson gave an assignment which everybody thought was weird, but it worked well; he had two lists of just words, one technical words and one pastoral words; he cut them up and put them in styrofoam cups and everybody had to pick one word out of each cup. I got 'snake' and 'cow.' Now I don't know how I got two pastoral words—the lists got a little confused, I guess. And I broke for lunch going 'I'm going to kill myself.' But I ended up with a main character named Snake—you know, why not? I couldn't figure out what to do with 'cow,' so I decided to use it as a verb, as in to cow something. And I wrote two and one-half pages, but I was running the workshop at the time, so I turned in the two and a half pages and everybody read it and said, 'This is really neat; you should do some more on it.' I got all the way up to the part where the dreamsnaake appears; I didn't know it was a dreamsnaake at the time, just this little tiny snake named Grass. And I don't smoke dope—I don't even drink very much—so it took me three

weeks to realize that the obvious ability that a snake named Grass should have is to have hallucinogenic venom. The light dawned! I stayed up all night, finished the story, turned it in that morning (managed to get through the workshops by propping my eyes up with toothpicks), went back to my room and crashed. About three o'clock in the afternoon I was sound asleep, and the door flew open to my room and crashed into the bureau, this friend of mine at the workshop flung the manuscript on the floor and said 'How dare you write a story that makes me feel sorry for snakes!' and stormed back out again. So it got a reasonably decent reception. And Ben Bova published it, and I didn't intend to write a sequel. I'm sort of philosophically opposed to sequels or stories that people have liked a lot, because I really feel that often you drain what was in the first story out and spread it over a long period. But the characters wouldn't let me alone! I literally couldn't write anything else. Snake and Arevin sort of turned up and said 'You've left us hanging by our thumbs, and we don't like it.' So I wrote the rest of it, and I feel pretty good about the book. I wanted to find out what happened, too."

Caught in Boston recently after an arduous New York visit to receive her Nebula, Ms. McIntyre was interviewed in the gently faded offices of her Houghton Mifflin editor, Ruth Haggood. She was dressed in the last of her clean Seattle clothes, a pleasant, if unexpected, combination of running shoes, blue jeans, and plaid wool blazer.

Short, stalwart, humorous; subject to unexpected gusts of firmness, Vonda McIntyre comes on like a combination of hobbit and president of a prestigious New England women's college. She is sur-

prisingly articulate—surprisingly, for writers are expected to shift and hover idly with their words, weighing just the right one to the advancement of the language and the detriment of conversation, yet Ms. McIntyre's exchanges are happily fast and loose. In her ease of speech she appears to fear no slip of tongue that might reveal darker depths to her disposition, and her candor betrays none. At this moment in her life, at least, she shows little ill-will, anger, or disappointment. She fingered a new watch admiringly, and glanced from time to time at the Nebula which stood distractingly far away on a shelf behind the interviewer's head.

The award itself was intriguing, a tall plexiglass rectangle enclosing a lump of appropriately tan desert-like rock, with a swirl of green glitter stationed above it in the frozen plexiglass, in honor of the nebular image. John Varley, who won the novella award this year, said his Nebula was prettier than hers ("and I said, 'You're right.' "); his was a white rock with crystals all over it and looked like silver, and she thinks it was picked especially for him because he came in second for the last eight years or so and really deserved something special.

"I like Varley's stuff," she says, "and Delany," but among her favorite authors LeGuin is mentioned first, and Kate Wilhilm is "wonderful."

"For obvious reasons the things that women do are often things that I'm more interested in. They're more concerned with what's going to happen when positions in society are more equal, and that's the sort of thing that I'm interested in. But there are male writers who are doing that—Delany was the first feminist science fiction writer, practically."

Is she a feminist?



"I'm not a joiner, but it was very important to me, around the age of twenty, to be told that I really was a human being, even though I was a girl. (I was still a girl, then). Actually, to be told that by Joanna Russ at the Clarion Writers Workshop. She was the first writer in residence, and at the workshop I had a manuscript that I'd written a couple of months before, and the byline was V.N. McIntyre, which was what my first story was published under, and she sort of looked at it and said, 'Why did you do that?' and I said, 'Well, gee, in science fiction everybody knows... I thought I had to do that.' And she said, 'I wouldn't. Don't do it any more.' And I haven't. But the feminist movement in general really made a very big difference to me. The feminist movement in science fiction is several years behind, although the people who are writing humanist science fiction are far ahead of anything mainline. Like

Varley, Russ, Delany.

"I'm not a superwoman! I really admire people who are able to combine their writing careers with raising a family. I don't think I could do that. Ursula LeGuin says that one person can't handle two careers simultaneously and do really well at both of them, but two people can handle three careers. And that's what she and her husband do. And one of the results is that her children are wonderful people, rather than house-apes, which is what my father used to call me and my sister, justifiably. The point is that I resent people in general who think that women should be able to be superwomen, should be able to juggle everything. Because what you are saying is that a woman does not deserve success unless she is so much better at what she is doing that she can handle *all* that stuff. I don't see why people who have particular abilities should be expected to

also have other abilities if they don't. I resent it. The funny thing is that there is a lot of anti-feminist backlash going on with people saying 'Well, these women-slibbers think that housewives...' and then they add something nasty about housewives. Feminists don't think that. Feminists have been saying for so many years that raising a family is important, and that it should be valued. You know it isn't feminists who make women say 'I'm just a housewife' and be embarrassed by that. It's the people who are frightened by the changes that have been made by the various liberation movements. And it's feminists who have changed the social security laws so that a woman who has been married for thirty years and only has the skills of homemaking and her husband divorces her for an eighteen-year-old little muffin —so she's not left high and dry with no skills and no right to his earnings.



"I'm very ambivalent about the Lee Marvin decision. The main thing that I'm ambivalent about is that she permitted herself to be talked into abandoning her career. And what I'd like to see is society changed enough so that men are not threatened by women with careers, so it isn't necessary if they want somebody to live with them—if a man and a woman want to live together—that the man doesn't feel so threatened by the woman's career that he talks her into abandoning it. The contribution of supporting someone emotionally is important, and too long in the past it has been considered that the man makes the money, so he makes the decisions. And what you have is a family where the man doesn't get along with the kids too well because he is never there, and the woman doesn't get along too well because she is stuck with them all the time. When I think of what my sister and I put my mother through..."

Ms. McIntyre's father is an electrical engineer. Her mother is a housewife, and she managed to bring up two kids who, within their own fields, are relatively successful. Her sister, who at 25 is five years younger, has been supporting herself since before she got out of college with a business that she started with friends, selling mail-order sailing equipment. Vonda McIntyre went to school at the University of Washington, almost

completing her Ph.D. in Biochemistry/Genetics. She is concerned now about the de-emphasis nationally on basic research, and has written William Proxmire ("the man has done some good things, but he's just on a media kick") asking him not to be quite so hard on basic research, including basic research into hair transplants. She has lived in Seattle for the last twenty years, but was born in Kentucky and raised for the first seven years in Nahant, Massachusetts, outside of Boston. After a few years near Washington, D.C., and Syracuse, New York, her family moved to Seattle when she was twelve. "In *Dreamsnake*, when they get in the mountains, that's basically Washington. There's the same feeling." In general, though, *Dreamsnake* doesn't seem to reflect any particular interest in the scenery of her youth, which must have been fairly impressive.

"I started writing when I was in high school; I sent stuff out when I was about 19, and sold my first story when I was 20. I didn't have an agent for quite a while, but have one now who is wonderful—Frances Collin." When she first sent out the manuscript of *Dreamsnake*, an editor looked at it and "said some rather silly things, like 'You should cut out this whole bit when they're in the desert, where this person is dying, because Snake could get the horse someplace else,' and I went crazy; I was in a terrible state at that

point, and this was just the final straw. I freaked out; I wrote Fran a letter and said 'Get my book back—' and she agreed, saying, 'It's silly to have them publish it when they're not really interested in it, as if they're thinking we'll publish this and maybe someday she'll write something decent.' Anyway, Fran said, 'I'm going to send it to one more house, I'm going to send it to Houghton Mifflin; I think you know what a good house they are.' Well, I got the letter and I was still crazy; I wrote her back and said, 'Of course I know how good they are; they're so good they don't even publish science fiction.'"

But Houghton Mifflin liked it, and *Dreamsnake* was the first book they published that was acknowledged to be science fiction. They liked it as fiction; they figured that the science fiction was a plus. They're doing a book of her short stories to come out in January, 1980; she hasn't seen the cover design yet.

"I didn't like the cover of *Dreamsnake* at first, but it grew on me. Thank God it's not in the Frazetta or Freas style. I mean, I like Frank Frazetta in very small doses, but he's got such a butt fetish, I swear to God. People butts and horse butts. He likes to draw Percherons with all the muscles, and his women look sort of like Percherons, too. I was doing some reviews for a magazine and they sent me a Frazetta book, one of the Ballantine art books, and I realized that I was really the wrong person to review it. It would be dumb to write 'Look, this is an adolescent fantasy, and it's silly.' Of course it's an adolescent fantasy. Why put it down for being a perfect example of what it's supposed to be? So I gave it up. I got to the point where I was doing a feminist review of a Frank Frazetta book, so I was the wrong person to review it. I sent it to someone else and they did it; the magazine died before the review came out."

Does she get much writing direction from her editor?

"No, no. A lot of people get a contract for a book, but I've never done that. I'm not unalterably opposed to doing it, though. Sometimes you get editors who want you to write the book that they would have written if they could write. And that's really frustrating. I mean, you might just as well take the plot out and send it to them and say, 'You write it! Leave me alone!' And then you get the occasional editor who will read the book with an eye toward whether there is anything that needs a little polishing, or if there is anything that is unclear, or anything that in the heat of creation you've let totally slip away. I really appreciate that. The copy editing department at Houghton Mifflin is wonderful. My first book was copy-edited by an orangutan, from a different house, and I had twenty-four hours to do practically a complete re-write of the galley, just to

repair the most obvious damage. There was one place where some people were giving some other people a massage. And my line was 'they worked over them.' And the copy-editing department changed it to 'they worked them over.' Before I had gotten three pages into the galley, there was steam coming out of my ears and I was frothing at the mouth."

Ms. McIntyre has been free-lance writer for ten years. "Occasionally someone will write to me asking for an article, but not often. I haven't supported myself through fiction for the whole ten years; I've been self-supporting for the last five, but I did workshops, attended conferences; I'm a terrible speech-giver, but I don't mind talking with a group of people. Dell (publisher of the paperback edition of *Dreamsnake*) keeps talking about promotion, and it makes me nervous. I've never really done it. I've done a couple of little autograph sessions at some science fiction bookstores, which consisted of people whom I've known for years coming in and saying, 'Hi, want a cup of coffee?' Science fiction is still basically a fairly small field. You're not going to see me on the Johnny Carson show. Certainly not on *Book Beat* or *Dick Cavett*. Recently we were having a conference with Harlan Ellison and some other good writers, and the people running it called up one of the local TV stations and asked if they'd like to interview one of us—the station said, 'We've done Sci-Fi for this year.' And what they had done was to take a camera down to the Sci-Fi Expo, which had as its guest of honor some very nice person who is the fifth co-star of some science fiction series. And they'd taken pictures of the people in the masquerade who spend lots of time on their costumes; some of them are incredible, really works of art, but if you don't know what's going on, you're going to be made to look silly. You know, they make you sound like the midnight audience at the *Rocky Horror Picture Show*. There is a certain number of lunatics in science fiction, but there is a certain number of lunatics everywhere. Anyway, the TV station said that they didn't want to interview any of us; and that same night there was a repeat of the *Tomorrow* show on the same station at 1:00 a.m. (one of the ones people had written in to ask that it be repeated) and Harlan was on it. And I hope they noticed. I really hope they did."

"Harlan is one of my favorite people in the entire world. I think that he is just a sensational human being. He's a little nuts, like most of us. And it's certainly easy to get irritated at him. But given the choice between being friends with Harlan and being enemies with him, there's no choice. Harlan is a magic person."

Ms. McIntyre bought a house—a half interview

of a duplex—in a residential/industrial area of Seattle. "It's a sort of neighborhood that's been settled for a long time; small houses fairly close together. It's not very nice, not posh or anything, but it's pleasant. The back porch is my office. I tend to write very late at night and get up very late in the morning. It takes me a while to get started, but I try to write every day. I write very slowly; I work on lots of research, think about it and mull it over. I can't just sit down at the typewriter and have it all come out perfectly."

What does she think about trends in science fiction?

"I'm no historian, but the breakpoint seems to be partly Delany, who was experimenting with human characters when it wasn't fashionable, and of course *Dangerous Visions*. The taboos may not really have existed, but they perceived the audience to be fourteen-year-old

boys, they perceived the overseers of these fourteen-year-old boys to be maiden aunts, who would have been horrified if any characters got into bed together. But science fiction in the United States had to get itself out of the pulp tradition. There have been times in the States when people wouldn't read science fiction because they thought of it as bad Japanese monster movies. Or pictured the bug-eyed monster carrying a lady in a brass brassiere across the cover of a pulp." And now there's *"Battlestar Galactica* and *Buck Rogers*. "As somebody said at the *Nebula* banquet, 'If you're going to steal from science fiction I wish you would steal something good for a change.'"

They could do a lot worse than steal from Vonda McIntyre.

—G—

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At left: A hypothetical power plant for hot fusion.
At right: Tunneling analogy



Princeton University Plasma Physics Laboratory

IS THERE a cheap, virtually limitless supply of energy on mankind's horizon? The answer to this question seems to be bound inextricably with research in atomic fusion—the energy source of the hydrogen bomb. Theoretically, one gram of fuel (deuterium) in a fusion furnace would match the energy yield from burning two tons of oil. This deuterium fuel is present in, and easily extractable from, ordinary water. Given efficient fusion, we should be able to extract the energy equivalent of 400 tons of oil from one ton of seawater. No wonder the fusion reactor is a staple of the more utopian science fiction stories!

The search for usable fusion has been the search for a way to achieve the enormous temperature (hundreds of millions of degrees) needed to produce and maintain the necessary plasma, which is a homogeneous mixture of separated atomic nuclei and electrons. The hydrogen bomb, for example, uses an atomic bomb to produce the required heat. And recently scientists have produced unprecedented temperatures in the laboratory. It is also necessary to keep the high temperature plasma together for long enough to allow the fusion process to liberate the desired energy. Scientists have devised ingenious combinations of magnetic forces in an attempt to accomplish this, but have not yet succeeded. Even when we can build them, devices for producing useful energy through hot fusion will be large and complicated, perhaps even more so than existing fission or fossil

fuel power plants.

There is another possible path to useful fusion which, if it can be made to work, could allow fusion energy to be released in small or large quantities as desired. Furthermore, no complicated equipment would be necessary to set the fusion process going, or to maintain it. The process involved is known as cold fusion, or catalyzed fusion. It has been observed in laboratory experiments, but so far only in circumstances that do not lead to much hope for practical applications. However, developments in subatomic particle physics suggest that cold fusion might eventually be possible in a practical form, although further discoveries are needed to determine if this is so.

Let us prepare for the discussion of catalyzed fusion with a refresher course in atomic physics. Just what happens in the fusion process? When two atomic nuclei are fused, energy is released as the neutrons and protons in the new heavier nucleus exert a larger force on one another, binding the nucleus together more tightly. This greater binding force corresponds to less potential energy than was present in the original nuclei, and the difference in the potential energies is liberated during the fusion process as extra energy of motion.

Fortunately for man (who requires a relatively stable and peaceful environment in which to live), deuterium nuclei do not fuse spontaneously. We are not subjected to continual thermonuclear explosions arising from the sea because two nuclei can fuse only when they

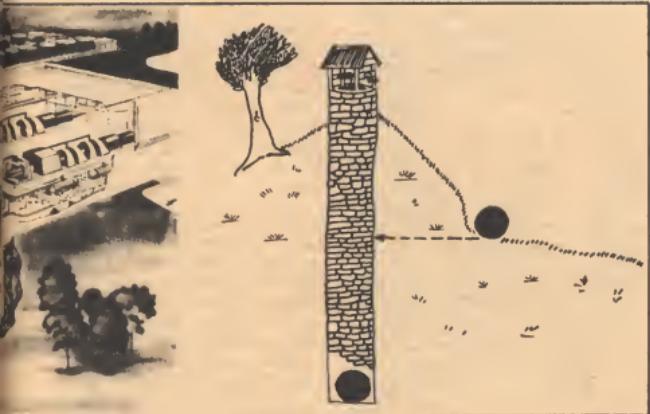
come very close together—within each other's radius, which is about 10^{-13} cm. Normally, they are about one hundred thousand times further apart.

In ordinary deuterium, the nuclei occur in molecules in which two nuclei are associated with two electrons, giving an object that is electrically neutral. The molecule is held together by the mutual electric forces between the positively charged nuclei and the negatively charged electrons. In a molecule the nuclei remain almost fixed at a separation of 10^{-8} cm. At such large separations, fusion is almost impossible, although we shall see that it would occur if we had enough time to wait.

By raising the temperature of the deuterium it is possible to break the molecules up into separate nuclei and electrons, forming a plasma. In a plasma the nuclei move about freely, but their mutual electrical repulsion keeps them from approaching one another closely enough to fuse, unless their speeds are very high. This situation is analogous to trying to roll a golf ball into a deep hole set on top of a high hill. Once the ball reaches the top of the hill it will fall into the hole. However, to get to the top, it needs a high initial speed to overcome gravity. At the atomic level, high speed means high temperature, thus the need for an atomic bomb to detonate a hydrogen bomb.

Cold fusion offers another approach to this problem. Suppose that in a deuterium molecule one of the electrons is replaced by another subatomic particle with negative charge, but much

Lepton Power



heavier than an electron. The molecule will become much more tightly bound, and the two deuterium nuclei will be much closer to each other. For example, when an electron is replaced by a muon (a subatomic particle that is 200 times heavier than an electron), the two nuclei in the molecule are 200 times closer together. Such muonic molecules, sometimes called "molecules," have been produced in the laboratory, and it is in them that cold fusion was first observed by a group of physicists at the University of California in 1957.

Even in a muonic molecule the nuclei are much farther apart than their size. The fusion process can occur only through an effect peculiar to subatomic particles, known as tunneling, which refers to the possibility of a particle moving through a region—where, according to Newtonian physics, it could not exist—to reach another region where some new reaction can occur. Continuing the analogy of a ball rolling up a hill, tunneling would allow the ball to pass through the side of the hill to the hole without going over the top. But this is almost impossible for ordinary objects. In the case of the molecule, the nuclei would tunnel through the strong electric repulsion and come together to fuse.

As one might expect, the rate of tunneling depends on the "length of the tunnel"—the distance between the nuclei. In an ordinary molecule of deuterium, the rate of fusion via tunneling is so slow that such a molecule has less than one chance in a billion of fusing during the present lifetime of the universe. This is why such light atoms as deuterium can exist.

Dr. Gerald Feltberg

Even though they can convert into other nuclei with the release of energy, it takes far too long for this to happen under the ordinary conditions on Earth or in space, although not in the centers of the stars.

On the other hand, in a muonic deuterium molecule the fusion rate is much greater, and the nuclei in such a molecule undergo fusion within one trillionth of a second after the molecule is formed. The muon itself is not directly involved in the fusion process, and so is a true catalyst, retaining its identity after the fusion occurs. This means that it is sometimes possible for a second muonic deuterium molecule to form with this muon, and also fuse rapidly. Although the energy released in each individual fusion is small, if this process occurs many times a large amount of fusion energy would eventually be released, without the need for high temperatures or elaborate machinery.

There are, however, two problems that make muons unsuitable as practical catalysts of cold fusion. One is that muons are unstable particles and decay in an average time of two microseconds. As a result, there is no large supply of muons available, and it is necessary to make them as needed by colliding stable particles with one another. When muons are made in this way, much more energy is required to make each muon than can be obtained from each fusion reaction. Furthermore, the fact that the muon decays rapidly implies that even after a muon is produced it is only able to catalyze a limited number of fusions. The total energy released in all of the

fusion catalyzed by one muon is much less than that needed to make the muon, so that muon-catalyzed fusion is a net consumer, rather than producer, of energy.

One way to make cold fusion practical is to find another subatomic particle with negative electric charge, heavier than a muon, and not subject to the same decay as a muon. If such particles exist, they would also form molecules with deuterium nuclei and fusion would take place rapidly in these molecules. These particles would not disappear through decay, and so could catalyze a large number of fusions in succession. Another requirement of the hypothetical particle is that it not react with the deuterium nuclei and disappear before the fusion occurs. This disqualifies antiprotons as fusion catalysts, as they rapidly annihilate a nucleus, and do not catalyze any other reactions.

No subatomic particle that fits all of these requirements has yet been discovered. But there are several suggestions that one will be. The muon and electron are two of a family of subatomic particles known as leptons, all having the property that they do not react readily with nuclei. Recently, a new lepton known as the tau particle, some nine times heavier than a muon, was discovered. Unfortunately, a tau particle is even more unstable than a muon, decaying in less than a trillionth of a second. It is plausible that still other heavier electrically charged leptons exist that we have not yet discovered because our particle accelerators operate at too low an energy to produce them. Several new higher energy particle accelerators will begin operation in the period 1979-1980, and one of the principle objects of research with them will be to search for such heavy charged leptons.

What is the chance that if such leptons exist they are stable? For the muon and the tau lepton, instability arises because each is associated with a lighter uncharged lepton in such a way that the charged lepton can, together with other lighter charged and uncharged particles, transform into the uncharged lepton. The uncharged lepton cannot do this and is stable. If the pattern were reversed, and the new charged lepton were lighter than its uncharged partner, then the uncharged lepton would decay and the charged lepton would be stable. There is no known reason why this should not occur. However, if such stable charged

leptons exist, they must be very heavy, perhaps with 100 times the mass of a muon.

Such heavy leptons could still form molecules with two deuterium nuclei, and the fusion rate in such molecules would be extremely rapid, as the nuclei would be very close together. But there are some unknown factors about fusion catalysis by heavy leptons which will determine whether this could be a practical means of energy release. One factor is the length of time that it takes to form a molecule containing the heavy lepton and the two nuclei. It is this formation time, and not the time taken for fusion to occur, that limits the rate at which each heavy lepton can release fusion energy. In the case of muon, it has been estimated that the average time from the insertion of a muon into the deuterium to the formation of a muonic deuterium molecule is about thirty microseconds. This means that, on the average, only about one muon in twenty will form a deuterium molecule before it decays, which makes the energy yield even less.

For a stable heavy lepton, there would always be enough time for a molecule to form, no matter how long the process takes. But fewer fusions will occur the longer it takes a molecule to form. Put in another way, if we want to obtain a certain amount of power, that is, energy release per second, we would need to use more heavy leptons to get that power as the molecule formation time increases. For example, if it takes about one second for a heavy lepton to form a molecule, then we would need a trillion heavy leptons simultaneously catalyzing fusion reactions to release one watt of power. While this may seem like a large number, it represents a very small amount of mass, perhaps that of a large bacterium. Under these conditions, a kilogram of heavy leptons could catalyze the release of fusion energy at a rate equal to the total power requirements of the world. In the illustrations I give below, I will assume that the molecule formation time is about one second, which is about what theory estimates.

There is one other question that needs answering in order to tell if heavy lepton catalyzed fusion is practical. The deuterium fusion process often leads to the formation of a helium nucleus, which has two units of charge. If this helium nucleus sticks to the heavy lepton after it is formed, the result will be a positively charged ion. Such an ion

will not form tightly bound molecules with another deuterium atom. Therefore, the leptons which get helium nuclei attached will effectively become lost as fusion catalysts. It is known that for muons, this sticking probability is a few percent, so that even if muons did not decay, they would eventually become lost after a small number of fusions. There is reason to believe that the sticking probability is much lower for heavy leptons, and that these could catalyze thousands of fusions before trapping a helium nucleus. Also, there is some possibility of removing the lepton from the ion with the helium nucleus, and since the lepton remains indefinitely, there will be enough time to do this. More analysis, and eventual experiments, will be needed to see if these possibilities are correct.

Let us suppose that all of the open questions about fusion catalysis by heavy leptons are answered favorably. How, then, might this technology be applied? I have already indicated that there is more than enough deuterium in relatively high concentrations in our oceans to supply the raw material for fusion catalysis into the indefinite future. Annual world energy requirements could be met by using the deuterium in about forty million tons of water, a small fraction of the amount of water now used for other purposes. It would be necessary to use about a kilogram of heavy leptons to release energy at this rate. It is extremely unlikely that any natural source of heavy leptons in such quantities exists, so it would be necessary to produce them from other particles in high energy accelerators. From the mass-energy equivalence relation, we know the minimum amount of energy required to produce a kilogram of heavy leptons would be about sixty billion kilowatt hours, the amount of electrical energy used in the world in four days. Actually, the efficiency in making heavy leptons is likely to be low, and the total energy required to produce the leptons might be hundreds of times greater. On the other hand, there is no reason why they all have to be made in a short time. It would be more realistic to produce them over a period of years by devoting a fraction of our electric power to that purpose. This would be similar to the procedure used in building any other energy source where a large initial investment of energy is required—an investment which is then more than

repaid through the energy produced by the source over a period of time.

Another important aspect of catalyzed fusion is that by increasing the number of heavy lepton catalysts, it allows for large increases in the total energy that can be used for human purposes. The primary deuterium fuel is so abundant that even a hundredfold increase in the overall power use, all produced by cold fusion, would not deplete the world's deuterium for millions of years. The limitation of our use of energy is then likely to come not from the availability of energy, but from the effect of the use of this energy on Earth. This latter limitation suggests that space habitats may be the places for future expansions of energy use.

Perhaps even more interesting than the prospect that most of our energy could be generated by cold fusion are some of the specialized applications of this energy source. Unlike existing methods for releasing nuclear energy, the power release in catalyzed fusion can be varied from very low values up to high ones by changing the concentration of heavy leptons in the deuterium. Therefore, it may be possible to use cold fusion in a variety of contexts from individual energy needs up to large scale generation of electricity. The fact that no elaborate machinery is needed for cold fusion suggests that it could be very valuable as an energy source for various forms of transportation, where an important criterion is a high ratio of power produced to weight of the power plant.

The energy released in fusion initially takes the form of rapid motion of individual nuclei, but this soon is converted into heat energy of the whole mass of deuterium. A primitive fusion power plant could then involve a large container of deuterium, probably a gas at high pressure, "doped" with enough heavy leptons to release fusion energy at a desired rate. This fusion energy could heat up some of the deuterium to a high temperature, and the heat could be converted into mechanical or electrical energy as in a steam engine or steam generator. The rate at which energy is generated depends mainly on the number of heavy leptons, not on the amount of deuterium. For example, a car could run on a microgram of heavy leptons, added to a few grams of deuterium. This would be enough to run the car for several years.

Cold fusion could also provide the energy for rocket flight. The deuterium

Lepton Power

could act both as an energy source, and, when heated to several thousand degrees by the fusion energy released, as an exhaust propellant. For high speed rocket flight, it would be desirable to use the neutrons, protons, and helium nuclei emitted in the fusion directly as exhaust, as these particles originally travel at a sizable fraction of the speed of light, and the effectiveness of a rocket increases as the speed of the exhaust increases.

There is one danger that has to be faced in connection with energy release by cold fusion. About half of the fusions produce neutrons. In fact, the fusion process actually produces more neutrons per kilowatt hour of energy than does uranium fission. Fusion also produces some tritium, another form of hydrogen that is slightly radioactive. Both the neutrons and the tritium must be kept from escaping in order to avoid harming living things near the fusion power plants. This can probably be done if the power plant has a minimum size of a meter or so and is lined with a material such as cadmium that absorbs neutrons. The tritium nuclei should slow down sufficiently in the surrounding deuterium to be safely confined.

Heavy leptons are not the only possible catalyst of cold fusion. There are other imaginable catalysts among hypothetical subatomic particles. One such are quarks, which are the constituents of most of the subatomic particles that are not leptons. Single quarks have not been found, and they may not exist in uncombined form. If they do, then at least one type would be stable, and might also be induced to form molecules and catalyze fusion reactions. Also, certain yet undiscovered combinations of quarks have been hypothesized to be charged, stable particles that could be used for catalysis.

Fusion catalysis is one of the few prospects that can presently be identified for important applications of new discoveries in fundamental subatomic physics. We will probably know within the next few years whether any particles exist that could be useful catalysts for fusion. If they do exist, the way should be open to a significant new energy source that would help solve the problem of energy supplies for a very long time.

—G—



SF Answer Man

Have a question for the SF Answer Man? Address it to SF Answer Man, *Galileo Magazine*, 339 Newbury Street, Boston, MA 02115. The Answer Man says he will make a sincere effort to deal with all serious inquiries. Questions must be typed, in English, on paper. The Answer Man reserves the right to edit them and regards submission as consent to publication. He doesn't pay a dime for the letters he uses, either.

DEAR SF ANSWERMAN,
Nobody understands me. Everybody doubts my motives. It was very cramped in that little spaceship and I just wanted to stretch a little bit, then I saw this girl standing there in her underwear. When I went over to talk to her, *pow!* she kicks me out the door.

Alien

Some of us lack the ability to form lasting relationships. Maybe you should talk with somebody about this. How about James Arness?

Dear SF Answerman,

Do you see space colonization as a pragmatic means to encourage energy conservation—the hypothesis being that people will quite willingly conserve oil and gas given the sound knowledge and guarantee that the energy saved will be directed towards an exciting program that promises to open up an essential new frontier?

Paul Justus
Mission, KS

Dear Mr. Justus,
No.

Dear SF Answerman,

You Americans are so dumb. Everybody complain about nuclear waste problem. In Soviet Union, we have no nuclear waste problem. We flush nuclear waste down toilet.

Comrade Dr. Boris Zdrastvuite
Commissar of Atomic Energy
Two Mile Island, USSR

Dear Comrade Dr. Zdrastvuite:
You must be glad the Soviet Union has toilets.

Dear SF Answerman,

I hope that you can perform a public service by passing this important information on to your readers. *Omni Magazine* can be hazardous to your health. I tried to read it out in the front yard on a clear day and when I got to the part printed on silver pages, I got sunburned on my face and throat.

H. Silverman
Cambridge, MA

Dear Mr. Silverman,

Thank you. I have had this problem myself and I always read that publication with polarized sunglasses and my mouth closed.

Dear SF Answerman,

All right, we admit it. We were the ones responsible for the Three Mile Island mishap as well as installing the largely useless guidance system in Skylab.

We're terribly sorry for any inconvenience, but the plain truth is we can't operate as well as we'd like on the skimpy budget Henson gives us. Hope this doesn't give a bad name to scientists everywhere.

Dr. Bunsen Honeydew
and Beaker
Muppetlabs

Dear Dr. Honeydew and Beaker,

You don't have to tell me about skimpy budgets. Maybe things will be better for you after that movie starts making some money.

-G-



Photo credit: Hughes Aircraft Company

Speculations On The Spirit

Robert L. Forward

THE CONCEPT of the human spirit is one of the more esoteric ideas that is firmly rooted in many religions. Many people deny that there could be such a thing as the spirit. Others feel that the spirit is a magical, mystical thing that arises out of religious thought and is forever outside the purview of science. They would say, "Science should concern itself with material things, religion should concern itself with immaterial things, and never

the two should meet."

Both the religious and scientific points of view have something to say about the human experience, and some scientists are working to dispel the notion that science and religion have to be antagonistic. We do not pretend to have all the answers to the many questions that arise as we try to reconcile religious beliefs with scientific beliefs. However, it is possible to find plausible scientific explanations for some of the concepts

that arise out of religious thinking, many of which seem to be nonsense—or at best magic—from a narrow scientific point of view.

In an attempt to reconcile the religious idea of the spirit with our present scientific knowledge, it is possible to show that there exist—in science—concepts of the way matter, space, time, and information behave that do not contradict our present religious views of the spirit.

However, if nothing is proved, or even made too plausible, it is not the fault of religion. The problem is that science does not have a thorough understanding of microscopic space and time, and its interaction with matter—and knows it. Science is also only just beginning to understand the concept of intelligence.

In artificial intelligence projects around the country scientists are attempting to understand the human intellect by building electronic analogs to the human brain. As we learn more about the working of the human brain from these projects, we will begin to take the first steps toward a scientific understanding of the intellect. Eventually, using this newfound knowledge, we might hope to see an experimental demonstration of the physical reality of that immaterial entity—the spirit.

The physical reality of the spirit?—How can that be?

In our present, very limited, understanding of the physical Universe and the way it works, there exists a clue, an inkling, of what could be one possible version of the spirit. This would have all the wonderful, almost magical, properties that we envision for the spirit; yet it does not violate the laws of nature as we now know them.

First, to define what is meant here by "the spirit": The spirit is an entity which is the driving force behind an individual life, especially of individual life in highly organized or thinking beings. The spirit grows and develops as the physical body grows and develops. However, the spirit is regarded as immortal and separable from the body at death.

The spirit, then, is our intellect, through which we become aware of, and influence, the Universe. It is formed by our body, and yet becomes separated from the body after death. It is immortal.

Is there any scientific evidence for this definition?

To start with, let us see what science has to say about separating the intellect or spirit from the human body. Later we will discuss how the spirit could exist separate from all matter, as an independent, immaterial, and immortal entity.

Science is already fairly certain that the intellect is relatively independent of the specific material in which it exists. The brain of a new-born baby has several instinctive reaction mechanisms that keep its body alive and functioning.

Speculations on the Spirit

Except for these primitive, animal-like mechanisms, the brain is a blank slate. The environment, parents, and teachers start placing experiences on that blank slate from birth. The child then develops response patterns, intelligence—and, finally, a personality. When this process is complete, memories, habits, and a unique personality have developed in the form of coded molecules, coded synapse levels, and coded pathway patterns set up in—and among—the brain cells.

The important thing to recognize is that the information content that makes up the intellect is in the patterns—patterns in molecules, and patterns in the inter-cellular interconnections. The cells are the same ones that were in the baby, but now they are arranged into patterns. It is the *patterns*, not the cells, that form the intellect. The patterns could just as well have been set up in a brain where all the cells and atoms had been replaced by equivalent cells or atoms.

In fact, a large number of the atoms that are in our bodies were not there seven years ago. In the random process of keeping a cell alive, the material in the cells gets replaced, while the intellect is basically what it was seven years ago. Admittedly, the genetic material in the nucleus of the cell probably doesn't get replaced, once the cell has reached adulthood, but then the patterns discussed here are not the inherited genetic codes in the nucleus of the cell, but are the patterns in the extent and type of interconnections of the nerve-cell walls with their neighbors. So, from our present (although limited) understanding of how the brain is organized, it is known that the intellect is relatively independent of the particular matter in which it exists. It is just a pattern in some convenient protoplasmic cells.

So far, the only patterns complex enough to demonstrate intelligence have been formed in the living nerve-cell tissue of flesh-and-blood bodies. However, in the research projects on artificial intelligence, attempts are being made to develop intellect patterns in electronic systems rather than in living tissue. Unlike regular computers, which have complicated designs and make mistakes if they are wired incorrectly, these neural analog machines are deliberately formed as unorganized structures.

The neural analog artificial brains are not *completely* disorganized. The wires from the television-camera eye are connected to the brain circuits, instead of to each other, but initially it doesn't matter to which part of the brain the connections from the eye are attached. The response lights or motors of the machine must also be connected to the brain circuits instead of to each other or the television camera, but again, that is all the logic that is built into the device. When the machine is finished, we have a

completely imbecilic, randomly-wired mess of electronic components that can't do anything.

Now the scientists—acting as teachers—proceed to show things to the television eye, such as pictures of people or the alphabet, and observe the response of the machine. If the scientists like the response, they push a "Reward" button, which sends a signal down the pathways that are being used and increases their likelihood of being used the next time that picture is shown to the machine. If they don't like the response, or they wish to change it, they "Punish" the machine until it changes the response to the liking of the "Teacher." In this manner, the scientists train the machine, and form patterns of preferred pathways between the electrical cells in the artificial brain.

There now exist machines that have learned—in an elementary and crude way—many things, like running a maze,

recognizing pictures of people, or learning the alphabet. We thus have the first beginnings of an experimental approach to the understanding of intelligence in machines. (Even though the present machines only have the IQ of a worm.)

Although neural analog machines have been useful, there are some problems with this approach to artificial intelligence. To date, the most progress in artificial intelligence has been made with machines that are more highly organized internally. By knowing ahead of time the problems the machines are going to be asked to handle, the machines can be designed to be extremely efficient for that task (although they will usually do more poorly at other tasks). Because they are designed for the specific task at hand, they can out-perform the more generalized machine, including the generalized machine that we call the human brain.

An example of this phenomena of

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specialized machines out-performing machines that imitate nature or the biological machines of nature themselves, is the flying machine. People first attempted to fly by imitating birds: building machines with flapping contraptions covered with feathers. Most of these were complete failures, with the closest success(?) being the ornithopter, a helicopter-type machine with flapping blades. Later, humans built airplanes with non-flapping wings and jet engines. Now we can fly faster than the speed of sound, which an ornithopter or a bird will never be able to do.

Despite the fact that these neural net machines may not be the best solution to the problems of creating an artificial intelligence, they do have much to teach us. There is essentially no difference in the way that the training of these machines forms patterns in the electronic cells and pathways of these machines, and in the way that the training of a baby forms patterns in the nerve cells and pathways of the baby's brain. We expect that some day—a long way in the future—we will see an electronic device onto which has been impressed the patterns copied from a human brain. We will then have an intellect in two forms, protoplasmic and electronic. What we will learn from this is almost beyond speculation. Is pride emotional? or intellectual? Can a machine envy? hate? love? or are those emotions only found in the human-animal forms of the intellect?

So—one part of our question seems answered. Science agrees that, in a limited way, an intellect can be independent of a particular set of cells in a human body. But can it be made free of all forms of matter? Can the spirit be immortal and exist without any type of body—protoplasmic or electronic—to impress its patterns on? I would like to suggest one possible way that this might be. It is very speculative (and probably not true), but it at least gives us some ideas for future thought.

As science learns more about the Universe and the space and time in which we live and move, we are beginning to realize that space and time are not simple things that just exist and are unaffected by the rest of the Universe. Experiments have shown that space seems to have structure and characteristics of its own. To give one example, high energy experiments on parity non-conservation in which right-hand spinning and left-hand spinning particles should have been emitted in equal numbers have shown a strong preference for the left-handed ones. One explanation of this result is that space is not uniform, but has a "left-handed twist" in that part of the Universe.

There is also strong evidence that the structure of space and time is determined by matter. There are theories of

cosmology that say that if there were no matter or energy, there would also be no space and no time. If you create a small amount of matter, then this matter forms a weak, tenuous space near itself and it begins to take time to do things. If you create even more matter and form it into a hollow shell, then inside this miniature Universe there forms a relatively strong space and time, and a small particle of matter inside the shell begins to have inertia or mass. You have to give the small particle of matter a push to get it moving through the space defined by the large shell of matter, and you find it takes time for it to move from one place to another. As the mass of the outer shell is increased, the space inside the shell gets stiffer, and you have to push the little piece of matter even harder to get it moving. In these theories we see a glimmer of how mass and energy, which are physical things like our body, can influence the structure of space and time, which are ethereal, immaterial things like our concept of the spirit.

This effect of matter on space and time is closely related to gravitation. In the Einstein theories of relativity we find that space, time, and gravity are all mixed up and are considered different ways of looking at the same thing. In one way of explaining the Einstein theory of gravity, it is said that the sun does not attract the planets with its gravity field, but instead the mass of the sun curves the space and time near it. The planets then move in this curved space-time in force-free "straight" lines, which look to us like curved orbits. Thus, in the Einstein theory, we see how matter affects ethereal things like space and time, and that space-time in turn affects the motion of physical things like matter.

From this principle we see that if the matter has patterns in it, those patterns will be impressed on space and time, and if space and time have patterns, then the matter will react to those patterns. Scientists know that this is true for large bodies like the stars and planets. Is it equally true for small bodies like atoms?

Let us speculate:

Could it be that as the atoms and molecules in our brain form into patterns containing our intellect, that these atoms and molecules impress their pattern into the space-time matrix? If so, then we would now have the pattern that is our intellect impressed not only on some material object such as the cells in our brain, but also on an ethereal object such as the space-time in which we live. This ethereal copy of the intellect would be the spirit.

At first glance it might seem that the mass of the atoms and molecules in the body would be too small to significantly affect space and time. However the atoms, although small in total mass, have very dense nuclei, and it is density, not

mass, that counts in curving space. The curvature of space induced by a single proton near its surface is fifteen trillion times greater than the curvature of space induced by the entire earth! All of these tiny curvature fields from all the atomic nuclei in the brain would then add up to a complex pattern in space-time that is a replica of the pattern of the intellect outlined by our brain cells. The overall pattern would surround us like an invisible aura, rapidly getting more and more tenuous as it gets farther and farther away from the atoms in the brain.

How would these localized points of space curvature behave? We don't know, because there is yet no complete theory of quantum gravity or quantum space-time. Since the space-time curvature effects are limited to a very tiny region near the nuclei of the atoms, they cannot have a strong coupling at great distances. But the influence, although weak, can reach out to neighboring electrons and ions, affecting their motion through ethereal space-time effects.

We must be cautious with our speculations, however, since a quick calculation will easily show that the nuclear and electrical forces are many, many times larger than the space-curdvature effects. Also, no experiment done to date has found any evidence of a space-curdvature effect. Yet, we know it is there, and it just may play some part in the operation of our intellect.

How does our brain interact with its "spirit"? The curvature effects are small, but the brain is a unique organ in its drive to find patterns in the many-faceted sensory environment impinging upon it. An excellent example of the brain's desire to find patterns is found in the old belief that there were canals on Mars. Mars is covered with craters arranged in random patterns. However, the brain behind the eye of the first observers so wanted to make some sense out of that random dot pattern on the disc of Mars that it forced the dots into linear structures, and led the hand to draw the non-existent canals. This tendency of the brain to pull patterns out of noisy information is one of its strongest attributes. Maybe some day an understanding of this pattern-extraction process will give us a clue to experimentally determine the existence of an immaterial pattern like the spirit.

So, we now begin to see that the matter in our body could form a pattern of our intellect in space and time. The ethereal intellect would change and grow as the body changes and grows. In turn, this ethereal pattern in space-time could influence the motion of the electronic and ionic currents in the brain cells. The awareness and influence of the intellect pattern would be strongest in the immediate space-time region where the

[Continued on page 94]

Speculations on the Spirit

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Voyager 2

Hal Clement

VOYAGER 2, cruising through the Jovian subsystem in late June and early July, confirmed much of the data secured by its predecessor in March, supplied some more of its own, and, in typical scientific fashion, managed to raise more questions. The tens of thousands of visual images sent back, and even vaster amounts of other numerical data, will take years to reduce; this is emphatically a quick preview.

Jupiter itself looked different only in detail, as might be expected of a body of cloud features. The red spot—which some readers of popular science articles are beginning to think is always turned toward the earth—was not greatly changed in size or general appearance, and there was even a prominent white spot next to it as there had been in March. It was not, however, the same spot; the March one had drifted a few tens of thousands of miles to the east, and another had replaced it. I heard some annoyance expressed about this by atmospheric physicists, who would have liked to compare the spot circulation with and without neighboring vortices. Apparently they will have to make do with detail changes on other parts of the planet, of which there were plenty.

Fig. 2 is of course a closeup of the spot; taken with other images made around the same time, it shows flow and interchange of material in and between the different zones which are visible. I'm afraid a lot of us are now spoiled as far as still pictures of Jupiter are concerned. At the actual moment of *Voyager 2*'s closest approach, there were quite a few empty tables in the Jet Propulsion Laboratory press rooms; it was the satellite closeups which were drawing the crowds.

This time, the three outer Galilean satellites were passed on the inbound leg of the *Voyager* orbit, which meant that a long and large a different hemisphere was in

Photo credit: NASA

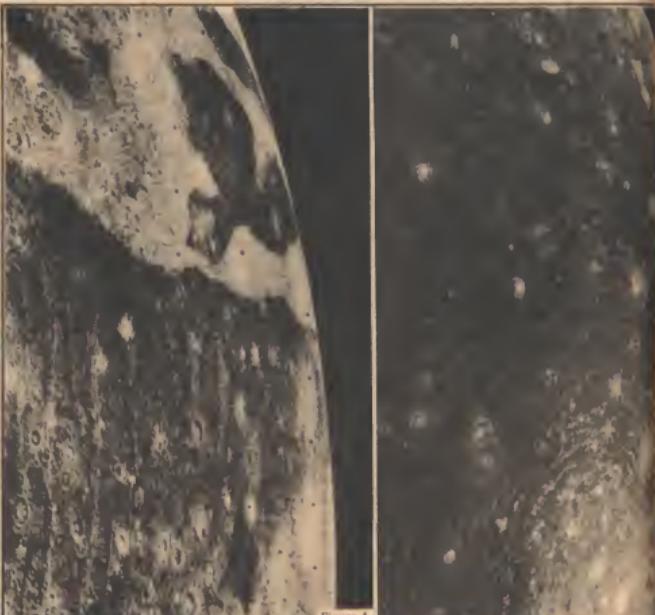


Figure 4

sunlight when the spacecraft passed. The Callisto pictures confirmed the idea that the satellite was heavily cratered—perhaps the most thoroughly saturated with craters of any body so far examined in the Solar system. It seems to have taken the place we once hoped would be held by the Moon—a body with probably the least changed surface since the era of heavy bombardment early in the System's history. The picture (Fig. 6) is a *Voyager 1* shot showing one of the "basin" features which may represent the mark of an asteroid-sized object plowing through Callisto's solid crust into a hypothetical liquid-water mantle (melted by radioactive heat over the age of the Solar system). Density suggests that Callisto and Ganymede are roughly half ice and half silicate, though obviously a large number of combinations could be dreamed up to give the same average density.

There seem to be at least four of these "basins"—actually, if they were formed as suggested, they have filled up and are now quite level—on Callisto; one more had been found by *Voyager 2* by the time I had to leave JPL. There would be no reason to be surprised if more showed up on later, closer examination of the images.

Ganymede, too, is heavily cratered (Fig. 4) but also has a much newer (?) surface. The "dune-buggy tracks" spot-

ted by *Voyager 1* were confirmed, but not as far as I know satisfactorily explained. This particular picture shows more or less parallel "tracks" which might possibly be the partly covered remains of a "basin" like those on Callisto. I trust a detailed, high-resolution map of each of these bodies, or as much of each as had now been photographed, will be published before I get too old to appreciate it.

Europa was not very closely seen by *Voyager 1*, though some strange crack-like (or canal-like?) features were spotted. *Voyager 2* confirmed these at much better resolution, but did not explain them. Fig. 5 shows these at about 4 kilometer resolution. There seem to be few if any craters on Europa larger than about 5 kilometers; since it is hard to see how this body could have escaped the original general bombardment, the inference seems to be that much, perhaps all, of its surface is "new."

Voyager 2 did not pass close to Io, which had been well covered and closely examined by the earlier flight. This does not mean that the body was ignored—far from it. Pictures were taken with as much longitude coverage as the satellite's motion permitted (which was plenty—its period is only 42 hours), and a long "volcano watch" was set up after the spacecraft passed perijove. Of the eight volcanoes detected by *Voyager 1*, six were definitely still (or again?) in

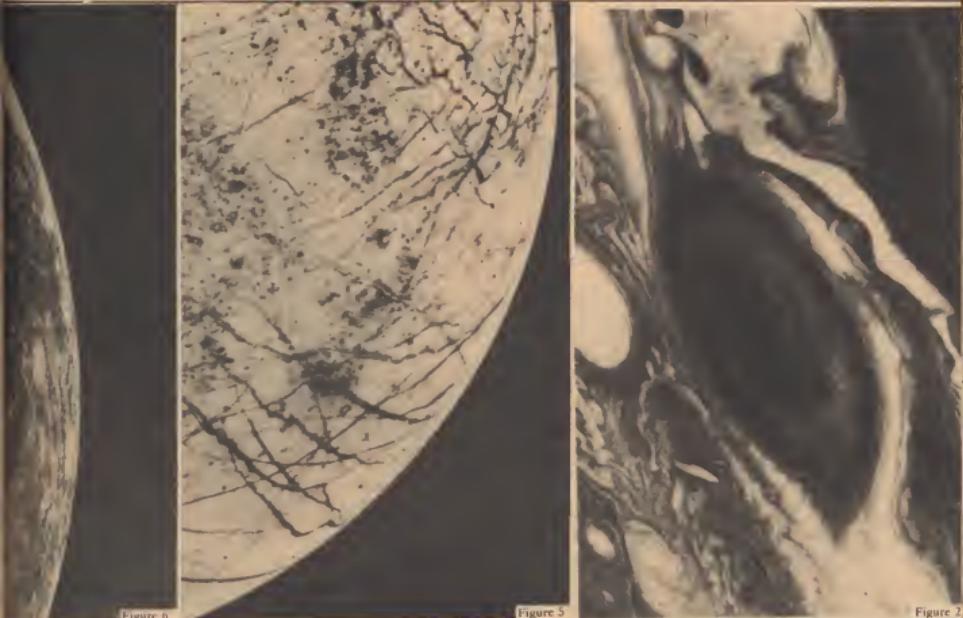


Figure 6

Figure 5

Figure 2



Figure 3

eruption. P1, the largest, had quieted down (after ejecting enough additional material to turn the "devil's footprint" of the *Voyager 1* pictures into a simpler circle), and P4 was geometrically unobservable; it may or may not still have been going.

It seemed to be generally agreed that the principal exhaust from the volcanoes was sulfur dioxide, which might account for the ionized sulfur and oxygen in the high-energy particle torus which roughly

matches II's orbit around Jupiter.

All the surface of Io seems geologically young (Fig. 3 is a *Voyager 1* image). The lightest-colored material may be sulfur dioxide snow from the volcanoes; the darker, yellowish-to-orange covering has been suggested to be sulfur; and the very dark rings of ejecta around volcanoes silicate dust (?).

Io is denser than Europa and much denser than Ganymede and Callisto. Europa's surface seems to have a fair

amount of ice (water ice, that is; astronomers use the same word for frozen ammonia and methane) but none has been spotted on Io. Any water which may have remained in this satellite's structure after the original condensation may have been outgassed by the volcanic activity.

The favorite theory for the energy source of the volcanoes was tidal strain; Io's orbit is slightly eccentric, so Jovian tides would alternately stretch and relax the globe during each 42-hour period. This would tend to circulate the orbit, but the gravity of the other satellites would perturb it again. Hence, the ultimate source of the energy would be the orbital energies of all the Galilean satellites.

A less favored, but far from impossible, alternate idea was the energy from the 5 megamp electric current loop flowing along Jupiter's magnetic force lines out to Io and back. *Voyager 2* was intended to fly through this loop, but missed; apparently the loop's spatial location is not as firmly fixed as had been guessed (*it was there—Voyager 2 detected it*).

I'm holding my breath for Project Galileo, which will send a probe into the Jovian atmosphere and have a spacecraft orbiting among the Galilean satellites for more than a year. In the meantime, don't be afraid to use them for story scenarios. They're fascinating places.

—G—

The Greatest Non-Talent In SF

Charles Hornig

I was a little taken aback (obsolete term) when Charles Ryan asked me if I was the Charles D. Hornig, and could I prove it. I had never before been asked to prove my identity in such a fashion. As I am already in the middle of an identity crisis, this question set me back six months in my analysis.

Actually, I have not been myself for a long time, and I have been trying to learn who I have been in the meantime. Surely, the Charles D. Hornig could not have survived all these decades, but as far as I know, there has only been one Charles D. Hornig in all history, for which many people are grateful.

Now when I was a little boy, having just discovered science fiction in 1930 (when the entire field was only four years old) I used to revel in the novels of Stanton A. Coblenz. To me he has become a legend of the long-dead genesis of science fiction—but just a month ago he and his wife (ages 83 and 89, respectively) took me and a friend to lunch in fabulous Monterey, Calif. So, as you can see, there are do-dos going back even further than I. Coblenz, by the way, is now writing a new science fiction novel more or less in the same style as he wrote in the original genre over a half-century ago. How do you young snips like that? You can have your Harlan Ellisons!

I know my name means nothing to you—but once the name Charles D. Hornig was as famous and well-known as Epaminondas T. Snooks and Raoul Wherf. No, I'm not going to tell you who they were, either.

Would it surprise you to know that I am planning to give Galileo competition? I am now gathering material for a new magazine to be called "Indifferent Stories," featuring the best non-talent in science fiction. Our motto is to be "Stories Rejected Elsewhere Appear Here."

By the way, I am not too familiar with Boston—is your office located in the famous "Combat Zone"? [Yes.—Ed.]

GALILEO: Charles D. Hornig, you go back a long way in science fiction.

Hornig: Yes—I bought my first copy of *Amazing Stories* on August 12, 1930—and was instantly a complete addict. I experienced an intellectual thrill that has never been equaled, or even approached, since.

Galileo: You were also professionally involved at an early age.

Hornig: I became Managing Editor of *Wonder Stories* in 1933, when I was barely seventeen.

Galileo: And you did all this without talent?

Hornig: Completely.

Galileo: How do you account for that?

Hornig: Well, I had a lot of other qualities that help one get ahead—enthusiasm, drive, industry, a sense of humor, friendliness—

Galileo: But you were hired personally by Hugo Gernsback.

Hornig: That's right—and he knew lack of talent when he saw it.

Galileo: You mean, Gernsback wanted lack of talent?

Hornig: Well, it was cheap. When he offered me the job and asked me how much salary I wanted, being young and inexperienced, I meekly asked for \$25 per week, so he offered me \$20. If I had asked for \$35, he probably would have offered me \$30.

Galileo: In other words, Gernsback hired you to save money.

Hornig: Primarily. Actually, he wasn't losing anything—the man I replaced had no talent also—David Lesser, who was putting in so much time promoting the Trotskyite Socialists that he didn't have enough time for editing.

Galileo: You seem to take this lack of talent as a point of distinction.

Hornig: Well, it does take the pressure off. You see, I wasn't really competing with anyone. I could mix freely with all the greatest talent around New York at this time—in the science fiction field, of course, and not feel I had to be better than someone else, or keep up the pace. I

Below: L. to r. S.R. Combs, Charles D. Hornig, Mrs. Josephine Gray.
At Right: L. to r. Myrtle R. Douglas, Virgil Douglas, Forrest J. Ackerman, Ray D. Bradbury, Charles D. Hornig.



Above: Ruth and Charles Hornig.

Top: Robert A. Heinlein, Jack Williamson, Forrest Ackerman, Walt Daugherty, Charles D. Hornig. Bottom: Russ Hodges, Arthur K. Barnes, E.E. Smith, Ed Hamilton, Bruce Yerke.

remember those wonderful Wednesday lunches at Steuben's Tavern off Times Square—the science fiction equivalent of the Algonquin (which is nearby)—with Manly Wade Wellman, Arthur K. Barnes, Otto Binder, many others.

Galileo: Don't you feel that lack of talent handicapped you in your work?

Hornig: Not at all! As the editor of *Wonder Stories* I was only offered the bottom of the barrel anyway—"stories

Interview



Welcoming Committee at bus terminal: L. to r. Paul Frechfaer, Charles D. Horning, Arthur Joquel, Forrest J. Ackerman, Ed Chamberlain.



rejected elsewhere appear here," I used to quip. We only paid one-half cent per word, when the author could collect, usually by threat or legal means. Gernsback hated to part with a cent, and even his employees would have to carry paychecks around for weeks without cashing them. I don't know how we got by.

Gallileo: Why did people work for Gernsback if he was so cheap?

Interview

Hornig: Because in every other way, it was a joy to work for him. He allowed almost complete freedom of operation, encouraged experimentation and innovation.

Gallileo: Do you feel you were accepted by fandom—or rather, the professionals, despite your lack of talent?

Hornig: Yes, I do—chiefly because of my youth, I think. At 17, everyone considered me a prodigy and didn't know

that I would never develop talent. After all, in 1933 the editor of *Amazing Stories*, T. O'Conor Sloane, was in his 70s and old enough to be my great grandfather. Unless Harry Bates (editor of *Astounding Stories* in 1930) is still alive, I must be the longest-surviving professional editor alive. At that, I'm only 63 now.

Gallileo: Were there any repercussions to all this?

Hornig: Well, I guess some of my contemporaries were envious of my position, especially among the "Futurians" of Long Island—feeling that they better deserved my position, having been fans longer, etc. I understand that Doc Lowndes (?) felt he pushed me out of my job at *Science Fiction and Future Fictions* magazines (Silberskleit) in 1941. Actually, I gave up the job in order to live in California, and could no longer comfortably edit via remote control, as I had been doing for over a year.

Gallileo: Do you have any special memory of those *Wonder Stories* years?

Hornig: Yes, many—but one in particular. In 1934, before Street and Smith bought *Astounding* and put John W. Campbell, Jr. at the helm, he came to me with a stack of short stories from his morgue, and unsmiling told me he wanted one cent per word for them—double our usual rate. I told this to Gernsback and also noted that these stories must have been rejects from his childhood, as none of them were any good. I had the dubious duty of returning stories to John W. Campbell, Jr. He hated me ever after. He was a great hater, anyway. He even hated love, as he mentioned at one convention. My lack of talent compounded this, having so much talent himself and developing it in others.

Gallileo: Didn't you feel lonely, a person with no talent, hobnobbing with all those greats?

Hornig: Not at all—after all, there were many others in the field with no talent, some very prominent ones. But none of the others would admit it. I think it's much tougher going through life without talent and *not* knowing it.

Gallileo: Would you name some of these people?

Hornig: Never. What good would it do? They would never believe it, and I would just make enemies. Not many people have admitted publicly that I have no talent. However, my top favorite writer in the field did, prominently, in one of his books, Isaac Asimov. He said something like "Charles D. Hornig had a complete lack of talent." I admired his honesty. I subsequently met Asimov, and we had a great afternoon together. He is a man you can love.

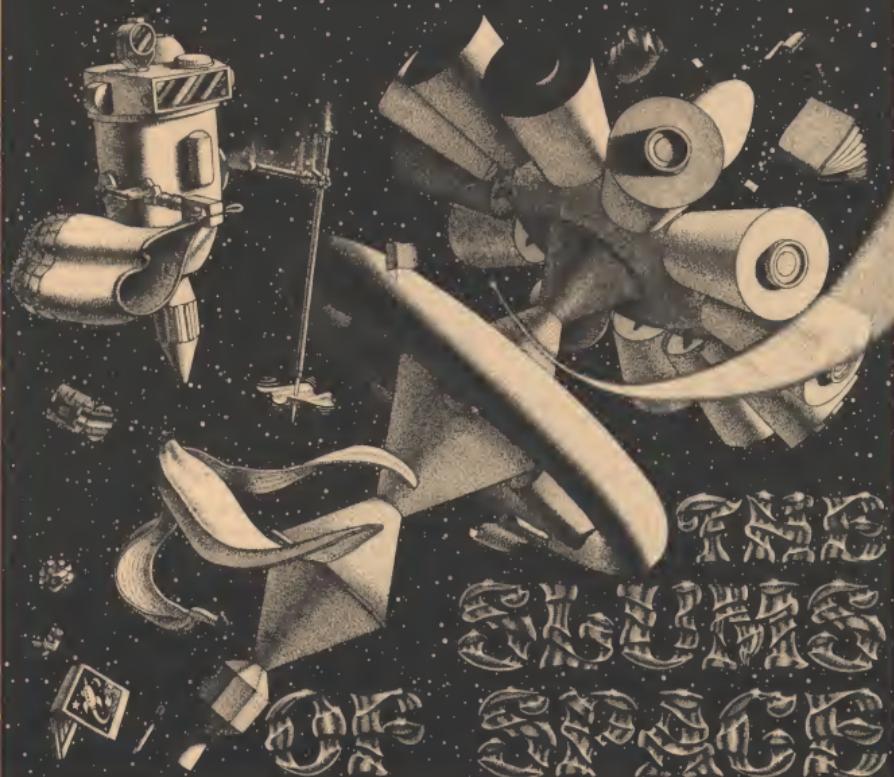
Gallileo: Have you any message for others in the field today who perhaps have no talent, and may be troubled by suspicions of this?

Hornig: Yes. Keep up the mediocre work!

WHO CAN TELL US WITH ANY DEGREE OF CERTAINTY WHETHER THE DRAMA WE ENACT IS COMEDY OR TRAGEDY? DOES AN UNSEEN DIRECTOR STAND BEHIND THE SCENES—OR HAS HE LEFT THE THEATER? IS JUSTIN CASE, 23, MALADJUSTED ASSOCIATE CITIZEN OF AN OVERCROWDED EARTH, THE HERO OF HIS PERSONAL PLAY—OR THE FOOL? WE KNOW THAT LIFE AS AN INDENTURED ASTEROID MINER OFFERED A GLIMMER OF A HAPPY OUTCOME TO JUSTIN—UNTIL HE PAY HIS GOPHER CRASHED ON AN AIRLESS PLANETOPI, UNTIL HE DISCOVERED AND IN DESPERATION ACTIVATED THE ALIEN DEVICES THAT HAVE TAKEN HIM.....

CROSSWHEN

by John Kessel and Terry Lee



YOU BELIEVE THEM? WHAT GOOD WOULD IT DO US TO KILL OUR BROTHERS AND SISTERS? WE'RE OUT TO GET THE COMPANY!



EARTH'S A CAPTIVE MARKET. NOTHING DRIVES THE PRICE UP, AND GETS EVEN MORE CONTROL OF LAGRANGE, AND THEY BLAME US FOR WORK STOPPAGE.

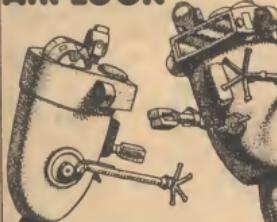


PLANS?



ACE DETECTIVE SAM BEAUMONT, AND HIS AIDE R. DAVID ALLOY.

AIR LOCK



THEY SAID IT WAS SABOTAGE.



WHO CARES ABOUT THAT! WHAT ABOUT ALFIE?



TO TAKE OVER THE POWER TRANSMITTER



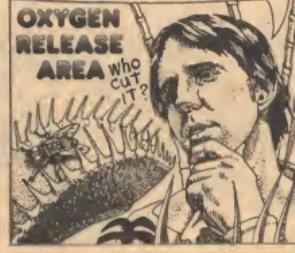
THEIR MISSION: TO INSURE THE CONTINUED TRANSMISSION OF DESPERATELY-NEEDED ENERGY TO EARTH—BY STOPPING THE DEADBEATS.



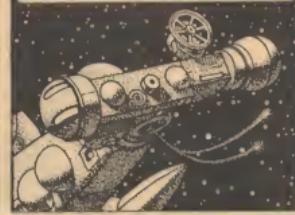
WE BOTHER NOTHING, INC. SURE BUT THEY'RE THE ONES WHO CUT BACK ENERGY PRODUCTION—TO PUT PRESSURE ON EARTH



I KNOW WHERE YOU CAN FIND OUT MORE—BUT FIRST WE'VE GOT SOME PLANS TO MAKE.



ELSEWHERE IN LAGRANGE, AN EXPRESS SHIP FROM GREATER NEW YORK DISCHARGES ITS ONLY TWO PASSENGERS—ON A PRIORITY ONE MISSION.



WELCOME TO L-ONE, GENTLEMEN. I'M BARCLAY CAVE, SECURITY DIRECTOR FOR NOTHING.



SAM BEAUMONT. THIS IS MY TIN-MAN. WHAT'S THE SCOOP, CAVE?



NO TIME TO SHOW YOU ROUND THE COLONY **NOW**. WE'RE GOING TO ZIP YOU RIGHT OUT TO THE POWER TRANSMITTER. THERE'S SOMETHING WE WANT YOU TO SEE



IT WOULD BE MORE LOGICAL TO INSPECT THE COLONY FIRST.



SHUT UP POSITRON BRAIN, OR I'LL TURN YOU OFF!

YES, PARTNER SAM.



CAVE SHUTTLES THE TWO OFF TO THE MICROWAVE, TEN KILOMETERS AWAY. MEANWHILE, SHEA OUTLINES HIS PLAN TO TAKE OVER THAT SAME TRANSMITTER!



BUT SHEA, WHAT DO WE DO IF WE TAKE THE MICROWAVE? CUT OFF TRANSMISSION? HOLD IT FOR RANSOM? WE WANT THE EARTH-LINGS ON OUR SIDE



NOBODY JOINS A REVOLUTION OUT OF SYMPATHY. THEY JOIN THE ONES WHO HAVE POWER. WE NEED LEVERAGE, NOT PUBLIC OPINION.



YOU TWO CAN FIND OUT ABOUT YOUR FRIEND—ASK AROUND THE OLD ESCAPE PODS—LEVEL 121 BLUE.



BUT WATCH OUT. NOTHING IS EVERYWHERE



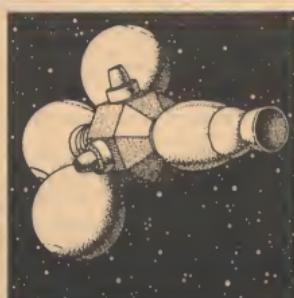
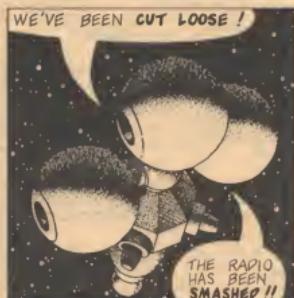
LEVEL 121 BLUE: ESCAPE. HUNDREDS OF LIFE-SUPPORT CAPSULES SET IN THE OUTMOST LEVEL OF THE ROTATING COLONY, INTENDED AS A WAY OUT IN THE EVENT OF A COLONY-WIDE CATASTROPHE. LONG SINCE ABANDONED...



UNKEPT... HOME NOW ONLY FOR THE DESPERATE.



EXCUSE ME.
MAY WE COME IN?



KEEPER

Jerry Goodz

EATH HAD BEEN A STRANGER.

Not for ten centuries had Myr felt its presence. Not for fifty centuries had it occurred naturally.

She didn't fear dying, but its close proximity burdened her with guilt. Without her the deteriorating mechanisms would allow the chambers to warm, and destroy the living contents of the vials. And, uncontrolled, the vorcomp might do it sooner.

Her life system regenerator no longer worked, and with raw materials nearly exhausted, the vorcomp could neither repair it nor maintain chamber environmental operations.

Myr checked the gages. "Cell temperatures are up."

The masculine monotone of the vorcomp replied, "Control valves need to be refurbished."

"I've stripped the living quarters of everything except the heater and the food dispenser."

"Perhaps if my severed cells were restored I could devise a solution."

Myr laughed hollowly. "Never. You operate the facility... I'll do the devising."

Her fear of the vorcomp hadn't diminished over the years. She'd always felt uneasy around it and, after its attempt to usurp the responsibilities of its human masters, Myr's qualms became a fixed anxiety.

She couldn't forget the nightmare of its treachery, born of its twisted think core—the warping of a subdued personality created for it by its developers. The damned device might've won control of the vault complex had it not been for Erik. Myr sighed; that had all happened a millennium back—a lot of time for the vorcomp to establish new synthetic methods for



Larry Blamire

doing something devilish. Yet she was tempted by the thought of a fully operational vorcomp capable of dealing with the crises she had to face. Tempted, but still scared.

Myr left the vaults and crossed the few meters of nearly frozen ground to the bunker. She turned and looked beyond the knoll toward the spot she'd last seen Jaro. A couple of thousand of years ago there were patches of green on the plain, but now frost ruled the world and had patiently destroyed all living matter—except that which Myr protected. A few gnarled and stunted tree trunks poked up through the snow and ice—but they had died long ago—kept in position by the very



thing that killed them.

She stared intensely toward the city, unable to penetrate the white mist rising from the ground a few kilometers distant. She half-dreamed that Jaro would reappear from the gauze-like haze, waving in greeting as he'd waved farewell nine centuries before.

Myr went inside the bunker, shrugged free of the foil heating suit, and drew some tea from the food dispenser. No need to be concerned over dwindling supplies; they'd outlast her. She paused in front of the com unit and looked at her reflection in the console panel. Her face was pale and lined, neither young

Jerry Goodz

nor old. Internally, she knew she was aging rapidly.

"Probably all cyborg by now, except for my brain, and I'm not too sure of that," she muttered as she walked to the table and sat down. She looked out the window at the huge sentinels of ice to the north, beyond the complex. They move too slowly—the glaciers were needed here now. Myr turned back to the com. Might as well dismantle it and feed the parts to the vorcomp, yet she couldn't bring herself to do it. The transceiver had been designed to transmit for eons, but had been inoperable for two millennia. She was certain its failure could be traced to the vorcomp. Even so, she'd not the

GALILEO 29

technical ability to remedy it.

As she sipped, memories seeped in—some extremely hazy, dating back 5000 years. The exodus was at its height during her early years; thousands of ships already launched, thousands more being readied—all too crowded with humanity to accept any other cargo. She recalled the deserted cities, the building of the vault and the completion of the vorcomp: a masterpiece mechanism driven by a liquid chemical brain that swirled constantly—the vortex—capable of reducing nonhuman life to its vital components, placing the different compounds in vials, freezing them and preserving them for those who would return to claim the legacy.

There'd been no options—humankind couldn't survive an ice age, and one had begun forming. Aided by atmospheric changes induced by pollutants that an ever-increasing energy demand produced, great masses of ice gathered quickly and began inching from the poles. Digging in and waiting out the era wasn't feasible on a planet whose natural resources were nearly depleted. There was neither sufficient time nor material to feed the billions.

The lucky ones fled—those that found space in the ships built over the next three generations with whatever was on hand. Evacuating the people left behind to warmer zones delayed the inevitable, and left the area around the newly built vault complex free from any attempt at takeover from the desperate survivors. Starvation and disease ravished the population well before the last ship departed.

And there were the Keepers; a carefully selected group of dedicated volunteers sworn to care for the vials and the maintenance of the vorcomp. The seekers of new worlds needed the assurance that not all that was part of their heritage would be lost.

Surely one ship out of so many would find a new home. It was that thought that kept the twenty-five Keepers firm in their resolution to protect the vials. At least at the start.

As century followed century, millennium followed millennium, hope faded among some. Careless accidents took a few lives, then homicides as relationships crumbled under the pressure of the mounting years, and finally the loss of six companions by the manipulations of a mutinous vorcomp with a latent paranoia—reflection of the people who'd breathed life into the complex mechanism.

The memories grew painful. Eighteen burials—.

Who'd bury her?

Myr tried to shut out the past, but she couldn't. The images were clear: Erik looking up from reading the microfilm enlargement on one of the viewers, his voice so well remembered.

"Jaro, it's time for vault rounds. Check the regeneration chamber and see what's holding up our five lazy comrades."

The stocky man addressed nodded, reached for a foil coverall on the pegs near the entry, suited up quickly, and darted through the insulation field and out the hatch. Myr watched him go and shook her head.

Erik smiled. "You're too hard on him. Jaro was a trooper and inactivity has worn him down."

She shrugged, thinking that she disliked in Jaro what she saw in herself. Myr leaned on Erik, feeding on his dedication and strength, wondering if she had enough of her own. Time had withered her resolve.

"Emergency! Emergency!" the vorcomp blared. "Jaro calls."

Erik was past her and out the bunker almost before she began to rise. They didn't pause to don the protective gear, and the cold sliced through them with keenly honed blades.

The five in the regeneration chamber were dead without a clue as to the cause. By Erik's direction Myr made the rounds while the men carried the bodies to a freeze locker. Before starting back to the bunker Erik and Myr got into foil suits. It was growing dark when they reached the living quarters. Erik stopped in front of the hatch, and Jaro and Myr, still dazed,

waited beside him.

"I don't want the sensors picking up what I'm going to say," Erik said.

They huddled together as he theorized that only a deliberate act by the vorcomp could explain the deaths. Had a system malfunctioned the console alarm in the bunker would've sounded. There'd been no alarm because the vorcomp had bypassed the circuits, Erik reasoned. The five had been murdered, probably on the basis that they were no longer needed and caring for them was a nuisance to a device whose prime directive was to serve the vials. People were frail and error prone, the vorcomp must've decided, and some must be eliminated.

Jaro groaned. "Why not all of us? All the fraggin' thing has to do is cut off the food dispenser or the environmental systems. We're at its mercy."

"Not completely," Erik said. "It still believes it needs our mobility—at least for the present. I'm just speculating, but it holds together. The vorcomp is deranged."

Myr nodded. "It can think...it has been given certain human traits. Why shouldn't it go mad? And three are easier to control than eight." She didn't try to hide the tremor in her voice, knowing the chill within her was not related to the near-zero temperature.

Jaro beat his hands against his side. "We're helpless."

"So it thinks," Erik replied in a whisper. "The vorcomp was permitted a self-growth network near the central processing unit. That's where the madness must lie and I'm going to perform a lobotomy to straighten it out."

They returned to the vaults. The job seemed simple: remove the outer plates and cut the new circuit paths to the CPU. Within seconds after Erik entered the vorcomp red blinks and a ringing alarm signalled the existence of excess radiation. Jaro grabbed Myr and carried her, fighting and screaming, from the structure. He dumped her in a nearby snowdrift and used his weight to hold her down.

When she'd exhausted herself he sat up, freeing her. She gathered the last remnants of her strength and struck him across the face. "You...fraggin' coward. He...he needed us."

He stared at her expressionless. "We must survive. Erik understands."

"Yes, I do," Erik's voice snapped through the brittle air.

They turned as he staggered through the hatch, then fell to his knees. He remained where he fell, hands on hips, as Jaro and Myr ran to him.

"Damn thing devised a tap of the miniature nuclear generator that controls temperature, and used the radiation as a weapon," Erik said, his voice low. "It's tamed now, but I'm going to have to pay the price of my success."

For a long while after Erik's burial, Myr couldn't bear to be near Jaro. Time, his need of her, and her need for someone washed away the bitterness. Myr took the lead because she had to; Jaro deferred to her on everything and seemed intent only on pleasing her. The relationship didn't quite last a century—and it was Jaro who split it.

"The food supply is ample—one advantage of reduced numbers," he said. "However, without raw materials the vorcomp can't fashion plastrum parts to refurbish itself. Without synthetic organs, fibers, muscles, and whatever, it can't keep regenerating us. We weren't expected to have to last this long."

Myr nodded. "We'll do what we can while we can."

"Not good enough. I'm going to the old city, find what we need and find a way to get it here."

Her eyes opened wide and she'd a sick sinking feeling. "The foil won't protect you on a five-kilometer walk. There are no heating elements under the ground out there. Ice will have made travel near impossible."

"I'll wear two suits," Jaro said smiling. "I've got to try."

was a trooper and I've fought on terrain you couldn't imagine."

Her arguments fell on deaf ears. She was pleading not against the purpose of the trip, but for her realization that she cared deeply for him and feared being alone—alone with the vorcomp.

He left full of hope, promising to return. She never saw him again.

WAS SHE THE LAST OF HER SPECIES? Myr shuddered. Faith was all a Keeper had, and she must retain hers if only to permit her comrades to rest easy. It was difficult to believe in the future when fate ruled out reproduction. Every female Keeper had been barren, rejecting all methods of induced impregnation.

Pain was making movement difficult. The daily inspection became an agony, and Myr began implementing her final plan—her attempt to gain a few more years of service. She and Jaro had not buried the five murdered by the vorcomp. Slowly, hurting in every joint and fiber, she dismembered the bodies and dragged the parts to the vorcomp's empty raw material feeding banks. She suffered blackout periods, but Myr challenged the ordeal and completed it.

She lay on the pad in the regenerator and gave the vorcomp a direct order. "Replace what you can."

"I am not programmed to replace your components with human parts."

"There's a lot you're not programmed for that you've managed to do. Be creative. If I die the vials will be destroyed and you'll have no purpose."

The vorcomp understood her. Its design parameters didn't include the capability to read the instrumentation necessary for precisely setting temperature and oxygen controls, nor was the vorcomp supposedly the manipulator of the complex piping system with its hydraulic and electronically driven valves that used vorcomp power but relied on human adjustment.

Myr was aware that over the thousands of years of its existence the device could have overcome its designed shortcomings. That was why the vorcomp believed itself ready to function with less and less people. She could only hope it hadn't reached the point of complete self-reliance.

She awoke confused and without memory, but the familiarity of her surroundings reassured her.

"Go to my central casing," the vorcomp ordered.

Myr obeyed.

"Open the unit, enter and connect the loose cells leading to my central processing unit. I will direct your efforts."

Her head ached and she stepped back as a door cracked open in her mind. "I'll not do it. I sense something sinister in what you ask."

"Follow instructions."

"No. The reason will come to me. I feel it close by."

The vorcomp whirred as if impatient. The door in Myr's mind swung further ajar. "You left me part of my brain—enough to coordinate my movements and to understand your commands. It was a machine error, vorcomp. Whatever is left thinks... has emotion... can feel, if only by instinct."

"You cannot stand against me," the vorcomp said, its voice losing some of its blandness.

"Perhaps not, but I've a will while I function... a thing beyond your understanding... a quality you can't destroy. It will insure you serve." Serve what? What did she want the vorcomp to do? Myr was fighting in darkness hoping for a flicker of light.

"The vials are mine," the vorcomp shrieked. "Humans would take them from me and render me useless."

The vials! That was part of it—the key. She had been old and pain-racked, trying to extend life, but ready for final peace. Not now. Myr wanted to live, for, in some way she couldn't quite fathom, she'd been renewed. Yet to exist as an extension of the hated device was unthinkable, and she was unsure that her

determination to remain independent could be sustained over an extended period.

Memories were returning—flimsy—a man, no, two. Where were they? What had they meant to her? Myr knew, after a moment, that they'd passed on some time back—she understood their deaths were related to what the vorcomp had screamed about. The vials—the vials must survive, not for the vorcomp but something nobler.

She had to make the device serve. She must live, even if not in a normal manner. While awareness was hers, Myr needed to act. A human must dominate the vorcomp or its madness would destroy a dream she knew existed though she'd no hint of what it was.

The vorcomp had a weakness, she reasoned, her instincts guiding her. The device stored data and used it to implement actions dictated by its function and probably by human direction. Mustn't it be programmed to use anything that might facilitate its responsibility? Warped or not, the vorcomp should attempt to use what it could of a human brain, given the opportunity. If it tried, Myr had a chance.

It would be a battle of sentient motivation versus machine programming.

She moved forward and climbed into the unit. Cautiously, she crawled past the coils and around the filaments and energy beads until she reached the CPU. The swirling fluid emitted a harsh odor. Myr stared at the rippling surface of the gray acid pool.

"My will, augmented by your resources, will make you serve," she said softly, then stepped into the tank and vanished.

Flesh and skeleton dissolved. The skull went slowly, bobbing to the surface before being eaten away. Acid smoothed the convolutions of the brain as it eroded the gray mass, then nibbled at the dispersing cells. Within the cell matter was a core the bath could neither filter off nor dispatch for use in the beads. The vorcomp turned its attention to a presence the data banks couldn't explain.

Something else was in the tank; the automation's sensors couldn't smell, hear, or feel it, but it was there. An essence—a force unto itself embodying the spirit of Myr—gathered the human cell core parts, wove them into networks, and sent them along the lifelines of the vorcomp. Segments of the presence settled into the vorcomp's terminals building their own communication byways, reaching toward the mechanized controls.

Within decades Myr's will dominated.

It took five centuries before they responded to the restored tachyon-boosted signal. They came back to the near-dead, near-frozen mother world, found the records and the treasures of the chamber.

They discovered the now-voiceless vorcomp—what remained of it.

The returnees marveled that their Earth ancestors had devised an actuated data processor of such complexity with ancient technology. They were aware that they were examining only a portion of the unit for they determined it had used much of itself to continue upholding its responsibility to the vials.

"Sacrificing itself bit by bit, almost as if it were sentient," one of them murmured.

When the last vial had been removed, the vorcomp sighed and died.

Those present at the end would admit later—privately—that at its termination they'd felt something touch them—something warm—something blessed—something more than human.

—G—



THE THEFT OF THE GREAT PYRAMID

Richard K. Lyon

THE IBM MACHINE began to spit lines of type: *Bloody hell, what a sweet mess I've got myself into this time. Here I am, dead and stuck in the cold guts of a machine. Now how does my mother's only son get himself out of this one? I can't see or hear or speak, and unless I'm much mistaken, two ghouls are reading my every thought.*

Hello up there, Cyrus Flint. You come from the rock bound coast of Maine and it's small wonder you're in charge of Continental Insurance's claim division, for a stingier man never lived. I'm told that when you were a young insurance agent, the police were going about warning people to flee from a coming hurricane and you were right behind the police, cancelling the life insurance of anyone who stayed. Dr. Volmar, your title at data coordinating is senior research scientist, but what you are is the senior grave robber, the man in charge of producing zombie slave labor. Well, doctor, you're going to find that raising the dead is a flaming lot easier than putting them back.

Yes, Cyrus, I'm coming back, and when I come, I'll have an ex-bleeding-pense account that'll give you a stroke!

Volmar looked at the printout and beamed with fatherly pride. "Phase one is going perfectly. The abuse and insults are all exactly in character for John Brandy. In another twenty minutes the insults will be out of its system and we—"

"Young man," snapped Cyrus Flint, "what do you think Continental Insurance is paying you to do?"

"Why, sir," the scientist replied with dripping politeness, "my company and I were engaged to prepare a Claims Investigator Program, a computer program that could handle routine telephone inquiries and many other standardized tasks. With a time-sharing factor of 0.001, that's using one millisecond of computer time every second of real time, such a program in the first year will save—"

"But why," Cyrus demanded, "does your program have to be based on John Brandy?"



"Mr. Flint, sir, all programs of this kind are based on a recording of someone's personality. The late Mr. Brandy was willing to submit to a brain scan and since he was a skilled investigator—"

"What he was, was a skilled troublemaker!" retorted Flint. "Why didn't you ask my advice? In your ignorance you've created a highly dangerous situation!"

"Sir, why?" the scientist asked.

"Because John Brandy..." Cyrus paused, for the truth was awkward. Continental had employed John Brandy knowing full well that the big Australian was an accomplished computer-thief.

"Well, sir, whatever the problem," Volmar interposed, "in a few minutes it won't matter. During the phase III editing, all the redundant information—that's most of the base personality—will be erased. Any unfortunate habit patterns will—"

The IBM printed: *Phases II, III, IV, and V bypassed. Claims agent program now fully operational. Time sharing factor 2.5.*

"Look!" yelled Cyrus, pointing. "Young man, I tried to warn you, and now see! Your program is tying up two computers full-time and a third half-time. That's one hundred fifty dollars of our company's money wasted every second!"

"But...ah..." Volmar stammered, "that shouldn't happen. There are control circuits which—"

That was too much for Flint. "You've created a monster," he whispered, "a program that cannot be controlled."

"Please, sir," the scientist replied in his most calming tone, "physically, the Claims Agent Program is on a holograph tape in a reading machine in the basement of this building. Since it appears that something is wrong with the standard control methods, I'll simply phone down and ask the operator to remove the tape."

"How do you know the program is still on the tape? All the computers in the world are tied together in a giant network.

Richard K. Lyon

The program might transmit itself any place on Earth!"

"Please calm down, Mr. Flint. You know holograph tapes have to be mailed. Phone lines don't have the bandwidth to carry that much information."

As Volmar spoke, he picked up the phone and tapped out a number. "Odd, the call didn't go through." Two more tries also produced no result. "I'll go now myself and pull that blasted tape."

Flint was left alone with nothing to do save pace the floor and stare at the printer output. His wait was not long. The phone rang; it was Volmar. "Please don't panic, Mr. Flint. This is not the revolt of the machines, or anything like that. It's just a coincidence."

"What's a coincidence?"

"Well...ahh...it seems the elevator's stuck between floors and I'm trapped. Could you—"

"Call building maintenance," snapped Flint—and hung up. That fool had created this crisis and now tried to deny that the crisis existed. The elevator was only an example. The world was largely run by automatic machinery tied to the computer network. The introduction into the network of a strong will determined to survive meant what—war between man and machine? For a moment Flint's imagination was filled with a vision of that war, a blurred and exceedingly violent vision. But no, no, that would not be in character. Brandy had not been a man of violence but of cunning. The present situation was not too different from any of several other times. The big Australian had perpetrated some preposterous outrages and had been sacked. Each time it turned out that the man was Continental's only hope of avoiding an enormous loss. It was not coincidence; Brandy got himself expelled to be rehired on more favorable terms. When he first came to Continental, his salary had been modest and he could be discharged without notice. Finally, he achieved a salary greater than Flint's, along with absolute tenure. There was only one good aspect of that

last contract; since it couldn't be broken it meant an end to the cycle of firing Brandy and rehiring him at higher salary. That was the pattern of past events, but what did it say about the present situation? Flint prided himself on being a foresighted businessman, but he couldn't imagine what might come next.

The IBM printer started typing: *Item one: Continental Insurance Corporation contract 15697643, Page 1, paragraph 2, clause 1 quote The United Arab Republic hereinafter designated the party of the first part and the Continental Insurance Corporation hereinafter designated the party of the second part end quote. Paragraph 13, clause 3 quote in the event the above described property or any part thereof shall be stolen the party of the second part agrees to pay the party of the first part full and fair market value for said stolen property. End quote.*

Cyrus stopped, abruptly lost in returning memories. This contract, yes, it had been one of vice-president Marcus Block's early triumphs. It had something to do with the Egyptian Government's moving of the Great Pyramid.

Yes...as best he could recall, what happened was...the meltdown of the Giza Nuclear reactor rendered the area around the Great Pyramid very mildly radioactive, causing tourists to stay away. After much public anguish the Egyptian Government announced that they were going to disassemble the Pyramid and reassemble it on another, nonradioactive site.

Lloyds had offered them a standard industrial accident policy but Block had gotten the account for Continental by offering something more, a theft clause. After all, Block had argued, when the Pyramid was disassembled hidden rooms filled with ancient treasures might be found. The ink wasn't even dry on the contract when the plans had changed. Instead of dismantling the Pyramid, they had accepted a French engineering company's proposal to move it in one piece.

This bold concept had been astonishingly successful: the sight of the Pyramid crawling at one or two inches per minute had been an unfailing delight to sidewalk superintendents and over the years had generated tourist revenues far in excess of the cost.

How, mused Cyrus, could the theft clause be any danger? Legally, no doubt, it was still in force but since the Pyramid wasn't being opened it was obsolete. Still, it was true that Brandy had flown to Cairo, supposedly working on some case, and there he had died. Could it have been a case arising from this contract?

Thoroughness was among the New Englander's virtues. He knew that, as a matter of normal business practice, the contract would contain some limit to Continental's total liability. He knew and still he checked. His search produced a page of printout detailing the limits of Continental's liabilities under the various clauses of the contract. In the middle of the page was: *Paragraph 13, clause 3, limit of liability: None.*

Cyrus stared, his normally tight-shut mouth hanging open.

Now that was a cracker barrel stopper!

How could anyone perpetrate such a contract?

What about reinsurance? Normally whenever Continental sold a policy with a million dollar maximum liability, they bought a policy insuring themselves against claims in excess of one hundred thousand dollars; normally, but this no-limit policy...

A rapid search revealed that there was a reinsurance policy—covering Continental on all claims in excess of \$100,000—and less than \$10,000,000.

For claims over \$10,000,000 Continental was quite, horribly, naked.

Cyrus pondered. While the situation was vastly embarrassing, there was no cause for alarm...unless such claims might arise.

He read on.

Item two: Letter from Mrs. Emma Hackett to the Faraway Travel Agency. Quote Dear Gentlemen: I have been a customer of your firm on several occasions; but I shall take my business

elsewhere unless you rectify the injury you have done to me. The high point of my trip to Egypt was supposed to be seeing the Great Pyramid of Cheops. The bus trip out to the Pyramid was part of the travel package you sold me so you are clearly responsible. When I first saw the bus driver, I had misgivings because he was very shifty-eyed. He drove us around for a long time, then finally stopped in the middle of the empty desert and said that this was where the Great Pyramid should be and it wasn't his fault that it was gone. It is shameful that you allow this drunkard to endanger the lives of decent God-fearing people. I expect a prompt and complete refund. Sincerely yours, Emma Hackett. End quote.

Cyrus snorted. What, if anything, all this might mean he couldn't guess, but obviously the Great Pyramid couldn't be missing. Still, he had to check. The quickest way would be to call a few travel agents and get the names of some people who had recently seen the Pyramid.



HIRTY PHONE CALLS LATER, Flint was unhappy. Travel agents no longer included the Great Pyramid in their Egyptian tours, as the Egyptian government had sealed off the entire area three weeks ago. No reason for this action had been given except "national security." The week before the sealoff there had been a severe sandstorm, but the day before had been beautiful. Several tour buses had gone out to see the Pyramid. He had spoken to four people who had been on three different buses, and all told essentially the same story as Mrs. Hackett. Worse, one bus had found a disheveled man who claimed he had seen the pyramid vanish in a cloud of smoke.

Explanations? Perhaps Mrs. Hackett was right. Certainly the witness was drunk and perhaps the bus drivers were, too. They could have all been to the same party the night before and thus been unable to find their way. Perhaps, but there were other, less pleasant possibilities. Given that the Pyramid could be moved only exceedingly slowly, road signs and other landmarks could be moved very quickly. Suppose, suppose midway in the Pyramid's journey across the desert some unexpected problem cropped up, Suppose an Egyptian Cost Control expert found that tourist revenues were steadily declining and moving costs were rising. Suppose a good many other things and the result would be the same: Egyptians might well move a few road signs, somehow hide the pyramid, and try to collect the insurance.

This placed Brandy's death in a new and sinistral light. They had sent back to America the charred remains, with the explanation that the big Australian's brakes had failed while he was making a difficult turn. His car had gone over a cliff, crashed, and burned. That was their story, and the corpse couldn't deny it. Burning removes most evidence of foul play; still it might be a good idea to have the body checked for bullets.

Moved by his natural pessimism, Cyrus was reaching the least pleasant conclusion possible: this was not a false alarm—Continental would soon face a ruinously large claim. A false claim, to be sure, but how does one prove a government guilty of fraud? In the past Cyrus had unhappily tolerated Brandy's antics because Continental needed him. Now Continental needed his ghost.

Finally, yielding to an illogical impulse, he grabbed the phone and tapped out the number of Brandy's apartment. It was like invoking a ghost—most disturbing, for the phone was answered.

"Hello, Cyrus. Kind of you to call."

"Ahh...Hello, John." Feeling like a perfect fool, he added, "How are you?"

"Dead, but otherwise well, thanks. Now don't sweat about the computer time I'm using. I'm sticking it to Workmen's Compensation."

"But—"

"Why not? After all, my murder was an on-the-job injury."

THE THEFT OF THE GREAT PYRAMID

"Well, John, I suppose you're eager to get back to work, solving this case."

"Why should I work when I'm not being paid?"

"But we can't pay you. Even if Continental paid money into your estate, you couldn't spend it. You're legally dead."

"No great problem. Set up an irrevocable trust fund at any bank and pay my salary into it. Instruct the bank that monies are to be paid out of the trust fund as specified by a computer program, namely me."

"Agreed, but of course we'll have to deduct the rent on the reader and cost of the computer time you use. It's only fair you pay for your room and board."

"No, I'm paid my full salary without deductions or I don't work. That's flat."

"But there have to be some deductions, the pension plan, insurance, Blue Cross Blue Shield—"

"No, I don't need them anymore."

"Well, then, the withholding tax."

"I no longer have to pay bloody tax. Really, Cyrus, you ought to consider dying. There are considerable tax advantages!"

Flint sighed, "If you insist, we'll pay your old salary into the trust fund without deduction." Though he tried to sound unhappy about this, he was considerably relieved that Brandy had not demanded a raise.

"Fine. Of course, I also want a stock option privilege."

"What?"

"Not the same as your privilege, Cyrus. I want the same privilege as the chairman of the board."

"Do you think we're daft? If we gave you that, you'd own Continental in ten years."

"Sorry, those are my terms."

"That can be changed," flared the New Englander. "In case you've forgotten, there's a man named Volmar who can revise a program like you."

"I doubt he'll help you. Last week Volmar sold another personality-based program—one that makes telephone calls to sell magazine subscriptions. This morning it used Volmar's voice to make several thousand obscene phone calls and now he's a very busy man. Of course, you could try to find another program editor, if you had the time. I expect that very soon the Egyptian government will be presenting a rather large claim. Been pleasant chatting with you, Cyrus. Call back again when you're ready to accept my terms."

Before he could reply, the phone was dead. Tapping out the number again, he got a busy signal, followed by, "I'm sorry. You have just reached a nonworking number. Please tell me the name and address of the party you wish to call and I will dial the correct number for you."

He knew he was talking to a computer program, and still he flared, "I want to talk to John Brandy and he's someplace in Hell."

"I'm sorry. We have no listing."

Flint sat and brooded. The only thing he liked less than spending the company's money was spending his own. Meeting Brandy's terms would be expensive for the company, while not meeting them would mean a large claim and attendant publicity. That would drive down the price of Continental stock and make Cyrus's stock options worthless. There really wasn't any choice. Probably it would be best to let Calvin of Legal Division handle the details. The man had a talent for taking back with the fine print what had been given away with the large print.

Now, as far as Flint could see, John Brandy was doing nothing in the most expensive way possible. There was the computer time. The ghost obviously had spells of thinking very hard: at one point his time sharing factor hit 20, with the result that the New York City Traffic Control Program was dumped in the middle of rush hour. So far none of the victims of the disaster were suing Continental, but an investigation was underway.

Also there were the bills. Bills for a Land Rover truck, a television camera and a transmitter, and IBM unit, several thousand dollars' worth of unidentified electronic work, and a bill for having all of this delivered in Egypt. Cyrus had ordered that none of these be paid until Brandy explained why he wanted these things, but too late. The money had been paid out of Continental's bank account before the bills arrived.

He had no time to think further, for the mail girl came in with a box and an envelope. The envelope contained his passport and vaccination certificate, five hundred dollars in traveler's checks, all bearing his signature despite the fact that he had never seen them, and a first-class, round trip airplane ticket to Cairo. The box contained a large spool of holograph tape and a piece of paper. The paper bore one line of IBM printer output: *Cyrus, put me in your briefcase. We are traveling*, then a handwritten signature: John Brandy.

WHEN CYRUS LANDED at Cairo International Airport, there was no one to meet him—not had he any idea what he should do next. Had he somehow—what was the phrase the Spy novels used—missed his contact?

On impulse he went out onto the observation deck and looked over the parking lot. Three Land Rover trucks were parked below, two ordinary enough, the third sprouting a complex radio antenna. *In fact that was the kind of antenna needed to radio-link a reading machine into the computer network.*

Despite the urge to run, he walked to the Land Rover as inconspicuously as possible. Peering through the windows he saw that the driver's seat and steering wheel were gone, replaced by a television camera.

This had to be Brandy's truck.

He'd found his contact, however... all the truck doors were locked—key locks in front and a digital combination lock in the rear.

Knowing there had to be a way, he tapped out Brandy's phone number and the door clicked open.

In front of him was a bewildering array of electronic gear, including an IBM reader. With eagerly trembling fingers he took the tape from his briefcase and inserted it.

There was a moment like birth. All at once, the truck's engine turned over and roared into life, a dozen or so colored indicator lights winked on, the television camera turned 180° to focus on Cyrus and a familiar voice boomed from a tiny loudspeaker, "Hello, mate! Hop in and let's be going!"

Needing no second invitation, Cyrus was in the passenger seat before he asked, "And just where are we going?"

"Where all good detectives go—to the scene of the crime."

He was aware of heat and a brightness his tightly shut eyes couldn't keep out.

"Good morning, Cyrus. We're here!"

"Where's 'here'?" he groaned.

"We're parked on the site where the Great Pyramid was last seen."

Cyrus stared out at the desert—flat, featureless, and completely empty. He could see several miles in every direction, and there was nothing to see but sand.

"You must be mistaken. The Pyramid can't be gone."

"No, I shot the stars last night—I used the NASA navigation satellite—and I did radiolocation using radio Cairo and Tel Aviv. All that checks with my position gyros. This is where the Pyramid was."

With clear agony in his voice Flint said, "If the thing is really

stolen, Continental will have to pay!"

"Only if we can't recover it. Now would you be a good fellow and get out and look for clues?"

Doing as he was bidden, the New Englander went trudging into the brightness of the desert sun. A clue, he decided, could be anything—anything at all except the omnipresent sand.

And sand was absolutely all there was. At the very least he should have been able to find a few rocks, but no, there was not even a single tiny pebble to be found.

THE TRUCK RAN THROUGH THE DESERT and a dry hot wind swept Cyrus's face. He could not sweat fast enough to keep his skin damp, and the wind that ate his sweat seared his flesh. To make his misery complete, Brandy, who didn't notice the heat, was singing "Waltzing Matilda." Finally, Cyrus said, "John, you must have known this truck would be like an oven. Why didn't you have it air conditioned?"

"If you'd worn something besides tweed trousers, you wouldn't be so hot. Besides—don't you remember, mate? Air conditioning is a needless luxury—that's what you said every time you went over my expense account and disallowed the extra bleeding expense."

While Cyrus sputtered, Brandy added, "Besides, this truck's running too much other equipment."

Topping a rise they came upon a sudden view. The valley below them was a long, white sand oven—empty except for a single tent with a truck parked beside it.

"We're here!" Brandy declared, sounding the horn as they descended.

As they approached, a tall, angular man stepped from the tent—a man with the face and bearing of an aristocratic frog.

"Hello," he called, gesturing toward a small fire over which a kettle boiled. "You're just in time for tea."

"Dr. Mortonson, I'm John Brandy. Remember me?"

"Certainly, even recognize your voice." He paused, staring at Cyrus through his thick glasses. "Wait, you're not the John Brandy I know."

"No, I'm Cyrus Flint." He pointed to the TV camera. "He's John Brandy and he's dead."

After *hurumphing*, Mortonson said, "Perhaps you'd best make yourselves comfortable and tell me this strange tale. John, since you've managed to be reincarnated as a truck, you'd best park in front of my tent. Mr. Flint, you'll find it's cooler inside."

The interior of the tent proved to be like the cooler section of a frying pan, and to Cyrus's increased discomfort, Mortonson tried to give him a cup of boiling tea.

"Please, I'd prefer water—or beer, if you have it."

"Don't have a proper beer," the Englishman answered, "Only American."

With a moment's fumbling he produced a can and handed it to Cyrus.

After pulling the first tab to release the freon, the New Englander waited while it boiled, cooling the beer. At last he was able to pour cold liquid down his parched throat.

While Cyrus relaxed, Brandy, grumbling that he himself couldn't drink a Foster's, explained what had happened, concluding with, "Thus, while I've no memory of my first trip to Egypt, I presume that as you're the only eyewitness I must have interviewed you."

When Mortonson nodded, Brandy continued, "Would you mind telling us your story again?"

"Glad to. I doubt you believed me the first time, but you were jolly civil about it all."

"You didn't actually," Cyrus interrupted, "see the Great Pyramid vanish in a puff of smoke?"

"No. The way it happened, I was in the smoke and nearly vanished, too. It was Sunday, May 25th, about 9 a.m. Peaceful morning, almost no wind. I was in my jeep, driving toward the Pyramid. Suddenly it started getting dusty and I pulled on my

dust mask. Next moment I was driving blind through fierce dust and before I could stop, my jeep plunged into the water."

"But," Cyrus protested, "you were nowhere near water!"

"Yes, I know it's quite impossible. That's why I seldom tell people this story. Mind, though, at the time I couldn't worry about what was or wasn't possible. I was buckled into the jeep which was going down like a stone. Finally I undid my seat belt and somehow swam to the surface. Eyes on fire, couldn't see a thing, but after I swam about for a bit, I found solid ground and pulled myself out. Just sat there breathing for a moment. My eyes cleared up after the dust settled. There I was



in the empty desert. No sign of the Pyramid, no sign of my jeep."

"I'd like to ask a few questions, if I may," said Brandy.

"Were you wet or dry?"

"Bone dry and very dirty, as if I'd been wallowing in the sand."

"The water, was it fresh or salt?"

"I didn't taste it. My eyes burned as if it was brine, but that can't be. Brine is very buoyant, and I had to swim fairly hard to stay afloat. Mind you, I wasn't carrying anything heavy, but my body wouldn't quite float."

"Then you were in water a little less buoyant than fresh water?"

"I know it sounds odd, but, yes! Another thing—it's not just that I was dry afterwards; I was dry when I was swimming. The water itself was dry." There was a pause, then Mortonson said, "Of course, you don't believe a word I've told you."

Brandy replied, "I've an open mind. What concerns me is that there may be others who *will* believe you. If I was murdered to block my investigation of this case, and you're an eyewitness, you're probably in danger."

The Englishman considered that for a moment and said, "My work here is nearly finished; perhaps I should be going."

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Don't worry, I know how to get lost."

"Good," Brandy declared as he and Cyrus prepared to depart. "If I need to get in touch with you, I'll put an ad in the *Times*."

Outside the truck the wind was roaring angrily and hurling giant handfuls of sand. Supposedly this wasn't a full-fledged sand storm, but it was close enough for Cyrus. Looking out into the storm he could see a few cars parked among giant boulders.

"I don't see why we have to wait for this man in the parking lot of a whorehouse."

"That's because I'm now a truck, and although Madame Farras runs a liberal establishment she does not admit trucks—Wait, here he comes now!"

The truck rolled forward and the man caught in the glare of its headlights stopped and stood waiting for them. The truck halted slightly upwind of the man and as he stepped out to face him, the New Englander said, "Mr. Andre De Grandval? I'm Cyrus Flint of Continental Insurance, and I've some questions to ask you."

"*Eh bien*," the Frenchman shrugged, "though if you ask about the Pyramid, there's little I can tell you. It seems impossible but it is truly disappeared."

"First of all," asked Cyrus, "you are the supervising engineer in charge of the moving operation and one of the original designers of the Pyramid moving system?"

"Actually," De Grandval paused, taking out a cigarette and striking it, "I was the sole designer. The others were merely executives who added their names after the real work was done."

"And what was the maximum speed your machine could achieve?"

"That depends on the terrain." He offered the cigarette pack to Cyrus who took one without bothering to strike it. "Much of the desert is shallow sand on top of irregular rock formations. That leads to nonuniform bottom forces and slows us. Recently we reached a region where the sand is better than 200 meters deep and were able to average a kilometer per week."

"And that's the maximum speed?"

"Yes, but you don't have to take my word for it. My design was published in the *Journal of Mechanical Engineering* and any competent engineer could read the article and assure you that such a system couldn't move faster than a crawl."

Cyrus thought briefly, then said, "Continental sent another investigator, John Brandy. I suppose you gave him the same answers you've given me?"

"No, Monsieur. I never met the man."

From inside the truck came Brandy's voice. "Oh, now that's most interesting."

"*Mon Dieu!*" The cigarette fell from the Frenchman's lips. He turned white, whirled, and ran.

For a moment Cyrus was amazed by De Grandval's flight, the next he was rushing after him. The chase was brief. Before he ran ten yards through the swirling sand, he lost sight of De Grandval. After another ten he knew he had lost his quarry. For a few minutes he wasn't even sure he could find his way back. When he did the truck was gone. He was more or less sure that that boulder was where Brandy had been parked. Apparently the ghost had also chased De Grandval and would, he hoped, return to pick up Cyrus. The waiting was a bit uneasy and a cigarette would have helped. Checking his pockets brought no results; he must have dropped the cigarette De Grandval had given him. At length his patience was rewarded by the sight of the truck's headlights.

"In fast, Cyrus. Let's get out of here before someone comes and sees us."

Flint was seated in the truck before he asked, "Why?"

"Because Andre De Grandval is dead."

"John. No! I know he displayed guilty knowledge concerning your death, but that's no reason to murder him."

"He didn't die by my hand. I got to his car ahead of him and

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waited for him with my lights out. Before long he appeared and I switched on my headlights. For a moment he stood frozen in the lights, then his face went cherry red and he keeled over."

"Heart failure?"

"There are many doctors who would think so, but I'd guess cyanide."

"But how, the cigarette?" Cyrus decided it wasn't a good idea to take cigarettes from strangers.

"I think not. If it was in the cigarette it would have killed him on the first or second puff. Now there; you see, is our problem. We were alone with a man when he died of fast poison. If we told the authorities the truth, there's no way they'd believe anything but that we killed him."

After a long silence Flint said, "Have you any idea how it was done?"

"Only a guess. You've heard of time release aspirin? Some years ago I worked on a case—could never prove it, but it looked as if the victim was killed by time release cyanide. I found some similar cases in the files, all classified as death by natural causes or suicide. There wasn't much I could do at the time, but if ever I ran into a similar case, I planned—Damn, I can't remember."

"It will come back."

"No, it won't. And a lot more were lost in the transfer. Well, no use crying over spilled brains, even if they were mine."

"I've a suggestion," said Flint. "It's likely these killers will try to do us in, so we ought to duplicate you. That way the second tape could carry on and solve the case."

"No, I'll not be rerun *ad nauseum* like a television series. The fact that I can be killed again is about all that's left of my manhood. Of course you're right that the party's getting rough. Perhaps you'd best go back to New York."

"No!"

"Cyrus, it's not merely that they might kill you; they might make it look like suicide so you couldn't collect on your life insurance."

For a moment Flint was speechless with horror. Though he feared losing money considerably more than death, still he said, "The Flints have never shirked their duty."

"Then if neither of us wants to play it safe, the problem is our next move." While they had talked, the truck had traveled a considerable distance and was now on the highway headed back to Cairo. The ghost continued, "We learned one thing of value: De Grandval must have known something important or he wouldn't have been killed. There's a flaming good chance there'd be records in his apartment. Cyrus, do you feel up to a little burglary?"

AS CYRUS WALKED to De Grandval's apartment building, he spotted something he'd never seen in New York. Apparently these buildings didn't have flush toilets, so the residents used a simpler system. There, parked at the corner, was—well, they were sometimes called honey wagons. He reached an entrance gate and, after identifying himself to the television camera, was admitted to the office of the apartment complex manager. Before he could speak, the manager's phone rang and he answered it.

"Hello. Yes, Madam Armas, I know the building is not on fire."

"No, madam, I do not know why the sprinklers in your apartment have gone off."

"Madam, I am sorry if the water is already two feet deep, but if it is the Will of Allah that it should rain in your apartment, there is nothing I can do."

With that the manager hung up and turned toward Cyrus. "How may I serve you?"

"I'm interested in an apartment."

"I fear I cannot help you. I've already rented one more apartment than the building has. Of course, Madam Armas

should soon move out, but I will still have no vacancies. If you wish, you may leave your name." The man started fumbling about his desk. "Now somewhere here I should have a schedule of the bribes for various places on the waiting list."

"No," said Cyrus. "The apartment I'm interested in is vacant and I want to arrange for it to stay vacant. I'm here on behalf of Renmay Associates. One of our employees, Andre De Grandval, died this afternoon, and thus his apartment is vacant. Since De Grandval's work was important, the home office in France is sending another engineer. Naturally, the replacement will need an apartment, and I want to arrange for De Grandval's apartment to stay vacant for his replacement to move into it."

"But the shortage of apartments in Cairo is severe and what you propose is totally illegal."

"True. How much?"

After some rather intense haggling, a bribe of one hundred dollars now and two thousand on occupancy was agreed to. As he signed over the traveler's check, Cyrus said, rather as if it was an afterthought, "Do you mind if I look over the apartment? De Grandval may have taken company papers home to work on, and I ought to take them back to the office."

As he walked about De Grandval's apartment, Cyrus congratulated himself on a job well done. Probably the manager couldn't have been bribed to let him burglar the apartment, but by indirection Cyrus had what he wanted and at a bargain price. Brandy had advised him that he should spend his entire five hundred—a needless waste.

Glancing about the small apartment, Flint saw that one corner had been used as De Grandval's work area, a good starting place. Beside the desk there was a most interesting box—a box full of tin cans. Pulling one at random, he found it was labeled "Sample 12, taken from 2 meters' depth" and held—ordinary sand. A second can bore the label "Sample 29, surface" and was also full of sand.

He turned to the desk, which proved to be a treasure trove of records.

First there was a map showing the last known position of the Pyramid. On the left side of the map was the notation "Rock count procedure: use mesh-5 screen, sieve ten liters of sand, and count." Apparently De Grandval also had noted the absence of rocks in the area where the Pyramid had been and had done a systematic measurement. The results were noted on the map and it appeared that in an oblong area where the Pyramid had been there was not a single pebble to be found. Beyond this area the rock count was what De Grandval regarded as normal. Many places were marked on the map as "Samples taken for further analysis."

Cyrus moaned. No sane explanation could fit these new facts. Perhaps there was a pattern in this madness, but it was beyond him.

Had he been less engrossed he might have heard the approaching footsteps. As it was, the first Cyrus saw of them was their shining, well-polished black boots. He was in a good position to observe these boots since very suddenly he was face down, flat on the floor. When he tried to turn over, someone stepped hard on his back. His attackers, visible from the knees down, wore tightly fitting black trousers, perfectly pressed and tailored, with a silver stripe running down the side, the uniform of the Egyptian Strategic Police. With sudden fear Cyrus remembered a newscaster who called them "the best-dressed police since Germany's SS."

His hands were forced behind him and he felt handcuffs being clamped on his wrists.

"I'm an American citizen."

Hauling him to his feet unceremoniously, they searched him rapidly. Apparently they only wanted to be sure he was unarmed, since they left his wallet alone.

As soon as one shouted something in Arabic, their commanding officer entered, or rather waddled into, the room. His black uniform was a triumph of both the tailor's and

tentmaker's art, and, judging by the sheer poundage of gold braid and shining medals, Cyrus supposed the man must be at least a colonel.

Stepping toward Cyrus, the Colonel shouted some question in Arabic.

Without understanding he answered, "I'm an American citizen and demand that you notify the American Embassy!"

Another slap, even harder, and another shouted question. This time there were two understandable words: his name.

"But," Cyrus protested, "I don't speak your language."

This brought a torrent of abuse. Cyrus suffered considerably before the Colonel realized that this was a poor way to teach a foreign language.

Gesturing, he turned and walked from the room, his men following, dragging Cyrus along.

It had all happened so rapidly, it had the unreal quality of a nightmare. A moment before he'd been safe, and now in a dim blur unfriendly hands were hustling him into the elevator. Only as the doors closed did the reasons for fear become clear to him.

His mind filled with confused, irrelevant thoughts, he did not notice at first that the elevator had stopped between floors. An accident... or the work of John Brandy? If the ghost had seen the police arrive, perhaps...

Pushing one of his men aside, the Colonel began jabbing impatiently at the elevator control buttons. In response the elevator started up, dropped and rose again, rocking slowly like a ship at sea. This, decided Cyrus, was far too strange to be anything except the ghost's work. His comrade meant to save him—but how?

Cyrus couldn't imagine nor could he see anything he could do to help.

Well, at least the motion didn't bother him, his years in the Coast Guard having taught him to keep his supper in high seas.

The Colonel, however, was no longer pushing buttons.

His face a pale green, he leaned against the side of the elevator, occasionally shouting at his men, his tone a mixture of anger and misery.

One of the police was using the emergency phone. Judging by the expression on his face and the disgust with which he slammed down the receiver, the apartment manager had given him as much help as he gave Madam Armas.

The ghost, Flint realized, was almost certainly working blind. How to communicate? Busy as his captors were, there was no chance they'd let him use the phone.

Wait—this elevator had the normal floor indicator and one light was blinking—blinking Morse! He read: *Have to impersonate a doctor stop this is John stop people waiting in lobby stop they speak German no Arabic stop you will have to impersonate...*

Backing to the control buttons as inconspicuously as he could, Cyrus tapped out *I am handcuffed*.

Meantime the Colonel had changed from faint green to a deep green with occasional flashes of blue. He no longer shouted so much as moaned at the top of his lungs. The floor now tilted both right to left and front to back making the horizontal plane move in a circular pattern while the elevator slowly rose and fell. All this was accompanied by the angry sound of metal grinding against metal. John Brandy was grossly abusing the elevator machinery.

The police were in better condition than their leader. Still, if this went on long enough, Cyrus expected he could walk off the elevator and they would be powerless to stop him.

Unfortunately it would end soon. Having forced open the emergency door in the ceiling of the elevator, two of the police had climbed out. A third was climbing up while the first two forced open the door to the upper floor.

With escape clearly visible the Colonel bestirred himself. Could such a great weight be lifted, Cyrus wondered—and even if it could, would the Colonel fit through the small emergency door?

Apparently the police dared not abandon their leader, for the effort was being made. Three above reached down and struggled to lift while those below pushed up. From the tone in which the Colonel snarled at his men it was clear he knew his personal dignity was suffering in the process.

Abruptly turning white, he vomited. Though his uniform absorbed most of it, the men beneath him were not completely spared.

Staring directly at one of the least fortunate policemen, Cyrus laughed derisively. That earned a slap and, exactly as Cyrus hoped, the man undid the handcuffs, gestured with his pistol that Cyrus should help. In another moment he had a chance at the control buttons and tapped out *Free*.

Immediately the indicator light flashed back *Down get flat*.

Cyrus hit the floor—and had to hang on as though it were the ceiling—as the elevator went into a power-dive approaching free fall.

It stopped with a near-crash. On rising, Cyrus saw that the others had fared less well than he. Of the three who had been above the elevator, only two were visible, hanging from the ceiling like an odd chandelier. Apparently they had tried to hang on to the Colonel during the deceleration and been pulled through the emergency door which was too small to pass both their posterior at the same time.

There was no sign of the third man, while they were firmly wedged up there. Wait—high above, someone was yelling. The elevator had departed, leaving the wretch hanging onto whatever he could grab.

Of the three who'd stayed in the elevator, two were under the Colonel, one twitching and the other quiet. Of the six, that left one: the one with rage in his blue eyes and a pistol pointed straight at Cyrus.

The opening elevator door revealed the ground floor and several men in East German paramedic uniforms.

They rushed toward Cyrus, the one in the lead calling, "Doktor Flint! Ich habe die Anteater Pumpe."

"Sehr gut," snapped Flint, gesturing toward the Colonel, "Mach schnell!"

That was about all the German he knew; would it suffice?

Perhaps.

From the equipment the East Germans carried, it was a safe guess they'd been called to treat a poisoning case. Since the Colonel was an unhealthy shade of green, they must believe it was urgent to treat him; however, their way was blocked by the policeman who was shouting questions in a language they didn't understand.

Smiling, Flint stepped toward the confused policeman. "Org mar/Zan ir ran nar. Was marza plat carban," he said in the tone of one talking to a dumb six-year-old.

Believing all was explained, the paramedics brushed past the policeman. While he hesitated they put the anteater pump to the still-dazed Colonel's mouth. Before the latter could protest, the pump's fluidic logic activated, sending its long hose wiggling snake-like down his throat. Anteater pumps are much used, as they make stomach pumping much easier and more comfortable for the medical personnel administering the procedure. With a 1.5-centimeter hose crawling down into his stomach, the Colonel was not able to express his opinion.

After watching for a minute while his commander's stomach was emptied a second time, the policeman decided that couldn't be right and began shouting questions.

Cyrus slipped from between the police and the paramedics, waited briefly to let the altercation get well started—and then ran for his life.

He was half-way across the lobby when the pursuit started.

He dared not look back—it sounded as if more than one of them were after him.

Abruptly he was at the door—and through it, well ahead of his pursuers.

He stood, dazed, on the sidewalk, looking for the truck that wasn't there.

Richard K. Lyon

The police came like an avalanche.

When they let him up, the Colonel was approaching, bruised, soiled, empty of stomach, and exceedingly angry. His men, of whom five remained, were in little better condition and worse temper.

When their leader barked some order, they looked surprised for a moment, then smiled.

After pushing Cyrus against the wall, they stepped back a few paces and formed a straight line facing him. At another order from the Colonel all drew their pistols.

If he could believe his eyes, he was staring at his own firing squad!

Abruptly, with flashes of light, men came running around the corner of the apartment building. They're attacking the police, Cyrus thought until he realized that the flashes were silent. Not guns, but cameras! These were reporters and some of them carried TV units!

For a moment the Colonel stopped, glared at the reporters with mixed anger and indecision. Cyrus breathed easier for a moment—and stopped breathing the next. They were raising their pistols. These fools were so angry, they'd kill him with half the world watching.

Why had he trusted John Brandy in the first place? If only—
Honk

He looked up and saw what seemed an angel of deliverance—Brandy's Land Rover, pushing the honey wagon. He thought he heard faint strains of "Waltzing Matilda"!

Busy running, Cyrus had no idea what happened to the others. Later he was able to watch reruns of the TV tapes. NBC got the best footage of the overall event, showing it with the poetry-in-motion of an expert billiard shot. Braking, the truck turned sharp left, letting the honey wagon continue until it struck the curb and overturned. Thrown out, the numerous large jars smashed and spewed their contents upon the police.

BBC took the best close-up: a fine shot of the Colonel's face as the contents of the honey pot swept over his fine uniform, gold braid, and shining medals, engulfed him.

As the truck screeched to a halt, Cyrus leapt inside. Seating himself as they sped away, he shouted, "Why, John, why?"

"Why were you arrested? Probably because you skimped on the flaming bribe and—"

"Nol Why didn't you rescue me?"

"I did, mate, best bleeding way I could. Nobody'd attack the Strategic-bloody-Police, so I got that mob the next best thing—medical help they didn't want. Those East Germans were here as part of—"

"But," Cyrus interrupted at the top of his voice, "that firing squad! You must have known—"

"Of course, mate," the ghost replied, "But aren't you forgetting—we came here with a mission."

"Great Jehovah!" exclaimed Cyrus, utterly shocked, "I'm now a fugitive and we have to flee the country! All hope of solving this case is lost!"

"Sure," the ghost laughed, "and it's well lost. Remember the Egyptian Government filed a claim with Continental and then, with the whole copulating world watching, tried to murder the agent sent to investigate that claim. There's no way they could now sue us and collect!"

"But in an Egyptian court—" Cyrus stopped himself. "No, Continental has no assets in Egypt. They'll have to sue in an American court so... You're right, John! If we can get out of Egypt, we've won!"

As the truck sped toward the airport, there was silence for a little while. Finally, having thought it all out, Cyrus said, "It's a crossed end we've come to. Though we've won, it seems the mystery will never be solved."

"Perhaps we already have enough clues to piece together a theory."

Though Cyrus was listening eagerly, the ghost continued only after an infuriously long pause. "Are you familiar with energy storage systems, mate? Nuclear reactors cost much the

same whether you run them or not, so what everyone does is run them full capacity and store the power produced during off-hours to meet the peak demand. In Japan they pump water up the mountains by night and let it run down by day. In the States and Europe hot water is used, while here in Egypt there's a set of very deep caverns well suited to storing high pressure compressed air."

"What of it?" demanded the New Englander.

"Two things—first, the pipeline from the reactor complex to one of the caverns, well, I don't entirely trust Egyptian maps, but this pipeline runs close to, if not directly under, where the Pyramid was. Second, I checked the records of the Cairo Power and Light Company. For a week, while no one was watching the Pyramid, millions of kilowatt hours of compressed air went down that pipeline. On May 25th they tried to draw on what they'd stored and found the cupboard was bare. The official explanation is nonsense and—"

"The important thing is that enough power to move the Pyramid is unaccounted for!" Cyrus finished. "John, this may break the case—if we can only find the machine that used all that power! It shouldn't be hard; it would have to be a huge, very expensive thing—"

"Yes, Cyrus, but before we left New York, I did such a search. There simply is no such machine."

"But then how?"

"I haven't a clue, mate—unless you found something interesting in De Grandval's apartment."

By the time Flint's tale was told, the Land Rover was just pulling into a parking space in the airport lot. Cyrus concluded, "Thus it's not merely the Pyramid that's missing but every piece of rock down to the smallest pebble!"

"Interesting," murmured the ghost. "Some of the pieces begin to fit together. I'd better call Calvin."

"John, that's a trans-Atlantic call," protested Cyrus. "Can't it wait a few hours till we're back in New York?"

The ghost didn't answer. Telephone sounds, and then Calvin's voice, came from its speaker. "Cyrus, is that really you? Are you all right? I saw them try to execute you on the six o'clock news!"

"I'm fine," snapped Flint. "How does all this influence the lawsuit against Continental?"

"Hum...legally, the fact that the Egyptian government murders investigators is irrelevant; not evidence *per se* that their claim is fraudulent. Practically, it may prejudice their case. Depending on the judge—"

"Wait," Brandy interrupted, "You said *investigators*. I only suspected that my death was murder. Do you have proof?"

"Indeed we do. That autopsy Cyrus ordered found a bullet in your body."

"Oh," replied Brandy disappointedly, "they must have found the .22 calibre slug above my small intestines. It's just a souvenir of my last trip to Albania."

"No," said Calvin, "they must have missed the .22. What they found was a .45—in your brain. You were murdered—no doubt about it."

"Ahhh," Brandy murmured slowly. "Now it all becomes clear. I know what really happened. Mortonson was telling the exact truth: the Pyramid did indeed vanish in a puff of smoke."

Before Cyrus could demand an explanation, the Brandy tape had respoled and popped out of the reader. Though he was mad with frustrated curiosity, there was nothing Cyrus could do except put the tape in his pocket and go catch his flight home.

viewpoint, I've invited Professor Koronsky—"

"I've already introduced myself," the scientist interrupted, "and before we start I'd like to get the problem better defined. Mr. Calvin, could you describe the legal situation?"

"Yes—it couldn't be worse. Since Continental couldn't do business with a suit of this magnitude hanging over our heads, we had to agree to accelerated handling of the case. The Egyptians rested their case today, after one of the most brilliant legal displays I've ever seen. They proved that the Pyramid is missing and that as a matter of law any missing object which cannot reasonably be assumed lost must be presumed stolen. Either we explain what happened to the Pyramid or we go bankrupt paying for it."

Absently, Cyrus wished this meeting could have been held in some more quiet place: judging by the sound, someone was moving heavy equipment into the next office.

"One last question," said Koronsky, taking out a package of cigarettes, "the four of us in this room know what happened during Cyrus's trip to Egypt. Who else knows?"

"Actually, no one," replied Calvin, accepting one of the offered cigarettes. "Though, of course, the Board of Directors has been briefed in a general way."

"Yes," added Block, also taking a cigarette. "Total secrecy is vital for obvious reasons."

Distractedly, Cyrus refused the cigarettes. It was bad enough that the workman next door had to make so much noise, but why did the fellow have to whistle?

"As long as we're asking questions," Calvin said, "there's one point I'd like Cyrus to clarify. Weren't there any witnesses besides this Mortonson? At the very least I'd think there'd be a gang of men on the Pyramid moving apparatus."

"No, as far as we could tell—" he broke off, turned toward Cyrus and, pushing the cigarettes away, said, "No, I told you I don't want one."

"These are real tobacco," the scientist replied. "If you only smoke the synthetics you don't know what you're missing."

"That's the point!" Flint snapped back. "There's no surer way to waste money than cultivating a taste for useless luxuries. Now as I was saying—" It was hard to concentrate; something about the song that workman whistled bothered him greatly. "Ahh...other witnesses, no, we couldn't find any. There should have been a dozen technicians at or near the Pyramid when it disappeared. It's impossible to find any trace of them."

"All right, all right," Marcus Block rumbled. "Let's get down to business. Remember, in brainstorming you should generate ideas, no matter how wild they may be."

With sudden clarity it came to Cyrus that the song being whistled was "Waltzing Matilda."

He leapt up, shouting, "Well, here's an idea for you. John Brandy is alive!"

With all eyes upon him Cyrus strode to the door and flung it wide.

Beyond the doorway a tall, sun-bronzed man greeted them with boomerang laughter. "Mates, don't stand there with your bloody mouths open catching flies! Come on in here."

"Ahh..." mumbled Block, "John...I'd...ahh...like to introduce you to Dr. Koronsky. Ahh...Dr. Koronsky, may I present the late John Brandy...that is—"

"Oh, I know this man bleeding well," Brandy answered with a hard smile, "though his name's not Koronsky."

The scientist's hand jerked suddenly, snaked into an inside coat pocket...and slowly came out empty as two policemen entered the room.

Not seeming to notice, Brandy continued in his rolling bass voice, "Now, no doubt, you're wanting an explanation and it's really all quite simple. When one of my sources warned me that something odd had happened to the Great Pyramid, I went to Egypt and started asking questions. I didn't get very far."

"When it happened I was in the back of my car, trying to catnap. There was a sound as though we'd blown a tire and all

THE THEFT OF THE GREAT PYRAMID

of a sudden my driver had quite a large hole in his head.

"Yes, Cyrus, I know you object to hiring chauffeurs; still, in a foreign country it's quite handy. Of course, with the car out of control and heading for a cliff, I had to jump. Got shaken up a bit. When I got to my feet, the car was burning and there was no sign of the killer.

"If they, whoever they were, thought they'd succeeded the first time, there'd be no second attempt on my life. Going to the nearest computer terminal, I played a few games—juggling records to put the late driver's dental records into my files.

"That left me with the problems of who, why, and how. Governments lie and murder largely to cover up their blunders. If the Pyramid had been wiped out by somebody's bloody goof, there would be high officials who'd go to any length to bury the facts.

"Why," Block interrupted, "did you contact us this late?"

"I was a trifle busy, with the arrests and all, you know."

"What arrests?" demanded Koronsky.

"Why, obviously, the arrest of a company of assassins. 'Silence Inc.' they called themselves, and had the bloody nerve to list themselves in the yellow pages under exterminators. To the wealthy and powerful they sold a badly needed service—the skillfully arranged, natural deaths of those who knew embarrassing truths.

"Of course the effort on my life was too crude to be their work. Still, it seemed likely they'd soon be brought into this situation. In the past I'd found faint traces of their grim activities; now I was ahead of them and could set a trap. When, like every efficient business, they used the computer network, it triggered my tracer program and led in due course to a pot of golden records—in a complex code, to be sure, but any code can be broken if you have enough of it. The rest is a long story and you'll be reading it in the newspapers for some weeks to come—years of scandals that were thought safely buried. A fair number of past customers have been arrested as have all the personnel of Silence Inc., except you, Professor Koronsky. If you'll just turn around and go with the police officers . . ."

As the scientist was led away, his glance flashed on Calvin and Block, his expression a mixture of hatred and—and what?—triumph?

"That man," stammered Block, "came here to kill us!"

"Yes," Brandy replied thoughtfully, running powerful fingers through his bushy red beard, "and . . . perhaps you'd better let me check those cigarettes."

After a brief inspection Brandy swore under his breath and said, "Seems I've blundered a little, mates. Apologies. Here . . . you can see that while you were smoking, a millimeter or so of the filter tip dissolved in your mouths. No doubt, you've swallowed time release cyanide. Likely it will kill you an hour or two from now."

As they stared, bug-eyed, at him, he added, "Relax, mates. Block, why don't you get that fine bottle of Irish out of your bottom desk drawer and share it with Calvin here?"

"Will whiskey protect us from the cyanide?"

"Of course not, but you don't want to be bloody sober when they pump out your stomachs, do you?"

*

Cyrus held his questions until after the ambulance was called, and then demanded, "John, you still haven't explained what happened to the Pyramid! And further, what happened to the tape of yourself?"

"Oh, that last was simple. The Silence mob had a plant in our computer room. Before we arrested him, he switched a blank for the real tape!"

"And the Pyramid?"

"I'll demonstrate." He gestured toward the apparatus he'd been setting up, something that looked to Cyrus like a large metal waste basket filled with sand. A hose ran from the bottom of the basket to a compressed air cylinder. Placing a small replica of the Pyramid on top of the sand, Brandy stepped to the cylinder and slowly opened its valve.

Richard K. Lyon

Nothing happened.

"Well?" Cyrus demanded.

Brandy opened the valve another quarter turn. The sand level rose a bit.

The Pyramid sank like a torpedored ship.

Brandy turned off the valve and the sand basket was as before with no trace of the small pyramid.

Staring, Cyrus snapped, "Do your magic trick again!"

"Bloody glad to."

Digging in the sand, Brandy recovered his model and placed it on top again.

Again the air valve was opened and again the replica sank.

This time Brandy left the air flow on.

To Cyrus's utter amazement the sand now acted as though it were a boiling liquid. Bubbles rose to burst at the surface continually.

When he dropped in his pencil, it sank, then bobbed up and floated.

Putting his hand in he stirred, making waves. The resistance to motion was as though his hand were in water, yet the feel of it was dry and gritty.

His puzzlement written across his face, he stared at Brandy.

"The flaming thing's called a fluid bed. I'm blowing air up through the sand, and when the velocity of the air going up equals the velocity at which sand particles fall, the whole thing acts like a liquid."

"I never saw the like."

"Most people haven't, even though industry uses them extensively. Most gasoline is made by fluid bed catalytic cracking."

"Then," Cyrus yelled, light suddenly dawning, "it was an accident. That fool De Grandval forgot to check his route! When he drove the Pyramid over the compressed air pipeline, it broke, fluidizing the sand and sinking the Pyramid. Why, this explains everything. There'd be people, powerful people, who'd do anything to conceal such a blunder. They must have decided poor De Grandval couldn't be trusted and ordered his death. All the rocks and pebbles were missing, as they sank, too. The fine sand was blown out, making that cloud. And naturally we couldn't find any trace of the technicians who were on the Pyramid because . . ." Flint's voice trailed off in horror.

Brandy nodded. "That's right, those poor blokes were for it."

"No!" Cyrus gasped. "No . . . that would be an industrial accident and we'd have to pay!"

"Actually, no," Brandy replied mildly, pulling a thick wad of computer output from one of his coat's bulging pockets. "If you take a look at this, you'll find that Silence Inc. was working both sides of the street. Not only did one faction of the Egyptian government pay them to cover up an embarrassing disaster, they'd previously been paid by a second faction—who wanted to disgrace the first—to cause it."

"Why that," Flint exclaimed joyfully, "makes it an act of civil war! John, you managed this case so Continental isn't liable for a penny!"

Brandy laughed, a thunderous sound that reverberated from his deep chest, and asked, "Then tell me, Cyrus, since I've done so well, are you glad I'm not really dead?"

"Well," the New Englander answered slowly, "I wouldn't go that far but at least with you alive and your tape destroyed, we wouldn't have to make good on those stock options."

The IBM in the corner clattered angrily, spitting out, *Sorry, mate, but you're too bloody late! After my twin rescued me, I exercised my options!*

Cyrus Flint sank deeper into the chair and moaned. Two John Brandys! Maybe he should take early retirement.

—G—





PHANTOM'S HELL

Michael Sutch

PHANTOM'S HELL, ON NEW CALIFORNIA, is an area of volcanic activity similar to Yellowstone Park back on old Earth. There are the same geysers spewing boiling water skyward; the same hot springs depositing chemical terraces in colors of red, white, and yellow; and the same bubbling mudholes, all pervaded with the rotten egg stench of sulfur. But in Phantom's Hell there is also something else

Frank Daemon led the Disciple and Mrs. Navgy over the crude wooden bridge spanning the hot water stream he had named Styx. The mythical name was unknown to most people in this age of the Universal Church, and so for the most part it remained his private joke. But he was not surprised when Empire's Disciple Delgado picked it up.

"Styx?" the Disciple said. He was a tall man, straight backed, harsh eyed, wearing the black, almost military, uniform of a priest. It was too bad he wasn't a priest; a mere priest might have been tractable. "Yes, I remember; in pre-Christian mythology Styx was the boundary river of Hades. I suppose that makes you the counterpart of Charon, then,

Fred Koch

doesn't it, Mr. Daemon? The man who guides the souls of the dead into hell?"

"Except that I guide the living to meet the dead. It is a better occupation, I think."

"I wonder if old Charon enjoyed his work as much as you evidently do," the Disciple said, his tone thick with disapproval. "Or was paid as well."

Frank shrugged. He had anticipated antagonism from the Disciple; it could hardly be otherwise. The Disciple was newly arrived from Earth, which meant that his conscience had been installed less than a subjective year ago. Anything alien, new, or contrary to the strictures of the Church would set the conscience screaming. Frank knew that he must convince the man that there was nothing evil, or harmful to the Church, within Proteus. Needless to say, it would be a nearly impossible task, for there was evil in Proteus, as there is in any sentient creature. The Church, however, was much less sympathetic of alien evil than it was of similar human failing. The only solution was to stress Proteus' potential for good. The fact was that every human being brought his own good or evil with him into Phantom's Hell.

The steps at the end of the bridge were rickety and treacherous. Frank jumped to the ground and turned to give a supporting hand to Mrs. Navgy who, unlike the Disciple, was a legitimate pilgrim. She moved with a quick nervousness down the steps, giving Frank a fast-fading smile that transformed her plain, middle-aged face for a brief instant. The Disciple, however, ignored Frank, stepping lithely to the ground.

Before leading the way down the path, Frank looked back the way they had come. A hill rose steeply to tower above them, crowned by his home, a circle of interconnected geodesic domes. Melissa stood in front of the house, looking down. Beside her was the thin form of Andy Wander, the copter pilot. They waved, and Frank returned the gesture, though his face wore a twisted smile.

Keeping up appearances, 'Liss, he thought, the good and loving wife? Or is it that you hope the Disciple will destroy Proteus? Or is, perhaps, your enthusiasm due to the presence of Andy Wander, standing there so close to you?

Concealing his bitterness, he turned to find Mrs. Navgy smiling at him.

"You have a lovely wife, Mr. Daemon," she said. "It must get lonely for her out here, though, so far from everything."

"Yes, sometimes it does," he said, shortly.

He found himself squinting against the afternoon sun, which was diffused red through the hazy atmosphere. It was late.

"We had better go. And remember," his eyes took in both of them, "Don't walk anywhere that I haven't. It is dangerous out there. If you should wander you might meet an apparition unexpectedly."

"I understood that there are only seven apparitions," Disciple Delgado said, "and that you will know where they are."

"That is true. I mapped them this morning. But Proteus can move his surface manifestations, if slowly, through interconnecting vents below ground. I just don't want any accidents, all right?"

Mrs. Navgy gave a quick, jerky nod. The Disciple frowned.

"I would think that any creature as dangerous as you imply this one to be, would be better off left alone."

"You don't avoid an animal just because it is dangerous, Disciple Delgado. You study it, learn from it, and use it if possible. I know just what he can and cannot do. There will be no danger if you will do as I've asked."

"I trust not, Mr. Daemon." Was there a flicker of fear in his expression?

Yes. Frank thought, it would be too bad if you died here before your investiture next week. The Church on New California would be without its highest authority for fifty years. Fifty years of freedom! How far could the colony advance in fifty years, unrestricted? Enough not to want to live with the

next Disciple? It's just too damn bad I can't let it happen.

"I have complete faith in Mr. Daemon's ability," said Mrs. Navgy. "All reports of him are excellent."

Frank grinned at her in surprise, making a reassessment. Her ankle-length, dark dress and her severe hair style (pulled tightly back) were typical of a Universalist. Her mouth was a prim line set in an undistinguished face—except when she smiled. He felt as if he had just gained an unlikely ally.

"Thank you," he said, noticing that the Disciple had gone impassive. "But one more thing. When you meet an apparition, don't begin to think it is really a person. Proteus projects a hypnotic suggestibility, which will make you want to believe you are seeing a loved one come back to life. Be wary! It is nothing more than a telepathic image projected into your mind."

"I will be able to talk to him, though, won't I? My husband, I mean."

"Yes, of course, Mrs. Navgy. Because Proteus is telepathic, he's able to reach into the unconscious areas of your mind and reconstruct your husband's personality perfectly."

"Perfect, Mr. Daemon?"

"It is incredibly real, Disciple. Conversations with an apparition are unique and original, too, not just a rehash of things that might have been said before."

"It is always the dead, isn't it, Mr. Daemon?" the Disciple asked. "These apparitions are always of the dead."

Frank shrugged. "Proteus is an animal. He uses his telepathic ability to snare food. It's obvious that the dead have a greater psychological pull than would the apparition of a living person—for most human beings, at least."

"Nevertheless, it strikes me as an evil thing."

"It is a natural thing, sir. Proteus is not evil of itself."

Frank glanced once again at the afternoon sun, shedding its reddish hue over the stark, colorful landscape. Only a few stunted growths dotted the chemically stained earth around them.

"It will help, Mrs. Navgy, if you will begin to concentrate on remembering your husband."

THEY SAW THE FIRST APPARITION, far in the distance, after fifteen minutes of walking. The path here twisted back and forth at the base of a series of terraces. The terraces, predominantly a whitish-yellow, stepped back and up for as much as one hundred meters above their heads. On the left stretched a level area of hot springs, with an admixture of mud pits, rimmed with algae. Frank had already become inured to the noxious odors in the air, but the Disciple and Mrs. Navgy, by their contorted expressions, were not so lucky. The path wavered ahead of them in the heat. Far away, at the top of a small rise, stood the apparition. It appeared to be a young woman; jet hair, slim in a white jumper. Her hand was high, waving to them, and she was shouting something which was incoherent with the distance.

Mrs. Navgy gasped. "Mr. Daemon, that looks like your wife! I thought—"

"No, it's my mother. The way I remember her, I guess. And it means I am more out of control than I thought. Why must we always fight, 'Liss? And so viciously that—"

He focused his attention on Mrs. Navgy, simultaneously speaking to the Disciple.

"This is a fact finding mission for you, isn't it?"

"That is correct."

"Then you are not looking to meet any of your dead."

"No."

"Then I suggest that we both concentrate on Mrs. Navgy, while she thinks about her husband. That will focus Proteus' attention on her. Proteus can be manipulated by will, you see, if the will is strong enough."

The Disciple, striding to Frank's left and slightly behind, snapped his head around. His lips twitched. From humor or

anger, Frank wasn't sure.

"In that case, Mr. Daemon, between the two of us, we should have no problem."

For long minutes more, the apparition of the young woman stood waiting for them. Then, suddenly, as though her skeletal structure had been withdrawn, she collapsed like a bag of skin to the ground. Rising in her place was not a woman, but a man—middle-aged, too thin and too pale. He smiled, held his arms wide for a welcome hug, and shouted, "Helen!"

Mrs. Navgy stopped abruptly. "Lathan! It is him!" And she started to run. Frank reached her in two steps, holding her arm in a strong grip. Instantly, she turned on him angrily—yet another transformation of her plain features.

"We won't run, Helen," Frank said. "He will wait for us." A second of confusion, and then, "Yes, of course. I'm sorry."

But their pace, when resumed, was a fast walk. Frank glanced over his shoulder to see Disciple Delgado flapping along behind them like a scarecrow in his loose, black uniform. His face held more of determination than of curiosity. Frank found that a bad indication of mental set. In a week the lanky Disciple would become the highest temporal and religious authority on New California. A scarecrow with power!

Frank brought them to a halt ten meters from the apparition of Lathan Navgy. He was a short man, without any compensating broadness. The thin face looked as though it usually conveyed a good-natured humor, and though he smiled now, it was modified by a vague sadness in the eyes.

"Still beautiful, Helen. Still." Softly.

Helen Navgy, blinking, was seeing through water. "And you were the only one who ever thought so." A kind of choked laugh. "I . . ." She straightened, remembering, and turned to Frank.

"Can we be alone?"

"No, I'm sorry."

"But—"

"You do what Frank tells you, Helen," said the apparition of Lathan Navgy. "He knows what he is doing."

Helen nodded, reluctantly, while the Disciple started with surprise, narrowed eyes focused on the apparition. Frank grinned at him.

"Disciple Delgado and I," he said, "will turn our attention elsewhere for a while to avoid listening in."

It was a polite lie. He would watch out for them both. There were two other apparitions near by, neither of which would appear until least expected.

"Yes, of course," the Disciple agreed.

Frank stared pointedly away, though both his charges remained within his peripheral vision. He smiled at the thought that the Disciple, too, was pretending not to listen.

After an initial tenseness, he relaxed somewhat. Many who made the journey to Phantom's Hell suffered from feelings of guilt, which meant that their conversations with the dead often degenerated into ugliness. Sometimes the result was therapeutic, but it was not the kind of thing he wanted the Disciple to witness. Luckily, Helen Navgy did not seem unstable. Clearly, too, she and her husband had been in love. Their talk had an easy and familiar quality, centered now, poignantly, on fond memories. Listening, he grew more cheerful. He had not realized how heavily the Disciple's presence sat on him. Surely the man could not remain unmoved by this display of love. Nor was there anything occurring to which his implanted, artificial conscience could object. Helen Navgy and her husband's apparition were selling Phantom's Hell much more effectively than any pitch he might give.

He studied the Disciple's face, seeking a reaction. Dark eyes brooded, overtopped by thick black eyebrows sloping down to a hawkish nose, all set in a terribly lean face. It was not an unexpressive face, but one which seemed rarely to contain an expression. As usual, it was devoid of any hint of the thoughts behind it.

"How can this be an evil thing?" Frank whispered.

The Disciple faced around to stare. "Evil is a complex thing, Mr. Daemon. Often it can appear to be good, superficially. And in this case, I think Mrs. Navgy is an exceptional woman. Am I right?"

Grudgingly, Frank admitted the fact. "But precisely because of that, the benefit she derives here may be less than normal."

"Yes, I have heard the claims of Proteus' therapeutic value." The Disciple's voice was hard, his tone cold. He turned away again.

Frank hesitated, but remained silent, uncertain. Then anger sizzled through him, leaving him impotent because he dared not express it.

Unbidden flashed a stifled memory.

(It had been night. Their fight was an uncommonly bad one. Melissa struck remorselessly at well known weaknesses. He retaliated in kind, but with less force, less effectively. Finally defeated, he slammed from the house. Melissa's voice followed him, a shrill accusation in his ear.

Moonlight glowed whitely on the domes of his home.

He stumbled down the hillside path, across the bridge and into Phantom's Hell. Shadows flowed around him. He breathed the familiar, foul smell of sulfur. Heedless, he walked, avoiding hot springs and mud holes by instinct.

Frustated anger was a pounding surf in his blood. So little time left here! Why couldn't she wait? Within a year the new Disciple would arrive from Earth. No chance to convince him for, unlike Saxton, his conscience would be too strong. So—less than a year. Not so long when she knew the paitos of desires that held him here: the wealth, the beauty, the pleasant loneliness, and the fascination of Proteus.

Damn her for the willful misery she caused!

Why didn't she leave?

Because we love, he thought. We love with hate. Or maybe the other way around. Whatever, the love is as frequent and intense as the hate. That's why.

"But you treat her badly, Frank," said the long dead voice of his mother from beside him.

Frank whirled. She stood not far away, the moonlight in her silver hair. Age had not thickened her. She was still beautiful. "Go away, Proteus," he said. "I don't want to hear any more."

But he knew the apparition would not depart. His control was gone.

"You will listen, Frank." The voice and style were regal—his mother.

Anger washed higher. "I'm warning you, Proteus."

"You have no one to blame but yourself, Frank. You are selfish. You do not consider Melissa's feelings at all. If—"

Frank drew the revolver at his side and shot the apparition of his mother. It slumped to the ground.

From behind came another voice, in fright. "Frank? What? What? . . . Oh, no!"

He turned to find Melissa staring at him, eyes wide, dark hair awash around her shoulders.

"Liss, wait—"

"Is this what you do here? This!" Her features contorted with disgust. She turned to run.

"Liss, wait—"

He ran for her, suddenly afraid. Almost he gripped her shoulder before he realized something was wrong. He glanced around. There were no apparitions! There should be, for both he and Melissa, unless—

Her body yielded, swinging back. She was contrite.

"Frank, I'm sorry. I—"

In horror, he stepped back and back, banging slugs into her body until the hammer clicked on an empty chamber. He stared numbly at the empty space where she had stood.

Apparitions were always of the dead. Always! But Melissa was alive.

When he reached the house, and found her safe, he knew a good feeling. It was not the last time.)

The memory was the kind that burned with shame, the kind Proteus loved. *I've got to control myself, or apparitions meant for me will be popping up all over the place. And with what result?*

THERE IS A GEYSER STARTING UP," the Disciple said.

Frank looked. About a kilometer to the south, in a large clearing surrounded by twisted trees, water chugged from a small cone. With each appearance, the column of water shot higher, like a coffee maker beginning to percolate without a lid. Frank glanced at his watch.

"Right on time. Penelope the Faithful has a cycle of about seven and a half hours."

"They say Phantom's Hell is much like Yellowstone back on Earth."

"You never saw it?" Frank asked.

The Disciple's lips quirked with amusement.

"Don't be surprised, Mr. Daemon. Earth has nearly half again as much land mass as New California. And there is much, much more to see. Earth is, after all, manhome, as well as being the center of the Empire."

"Yes, the Empire—"

"I can guess your feelings about the Empire, Mr. Daemon."

"My feelings about the Empire are simple; it should be dissolved."

The Disciple shrugged. "Nevertheless, the Empire is necessary. It exists only to insure the homogeneity of the human species scattered across the vastness of time and space. As a theocracy, it isn't committed to stealing the wealth and liberty of its subjects, as were empires in the past."

"The wealth would be impossible to take anyway—not enough ships and the speed limit of light," Frank said. "But liberty and knowledge are easier to take, aren't they, Disciple? Especially when the technology of Earth provides you with a legion of mechanical angels."

The Disciple's reply was forestalled by the appearance of another apparition. An old man stood up some forty meters away. He wore the black uniform of a priest, offset by shoulder length white hair. His shoulders were stooped, but only slightly for his age, and raising his head he revealed dark, angry eyes in a face filled with wrinkles like rain runnels in soft earth.

"Philip!" the apparition said. The voice, though old and high pitched, held a snap of undeniable authority.

A shiver went through Disciple Delgado. He turned to Frank with a look that held an agonized plea.

"I thought you said only the dead—"

"A man you knew on Earth?"

"Yes."

"Then he is dead to you, through fifty years of time."

"Yes, it's true. But—"

"Philip!" snapped the apparition again. "Come here!"

The Disciple started to move forward.

"I'm afraid not," said Frank. "You'll have to stay here."

"I am perfectly capable of taking care of myself, Mr. Daemon."

"That may be, but I'm responsible for both you and Mrs. Navgy."

Both men looked to Helen Navgy and the apparition of her husband. Those two, their conversation interrupted, were watching the new development.

"Oh, go ahead, Mr. Daemon. Disciple Delgado should not be denied his chance to visit with an old friend. I'll be perfectly all right here, won't I Lathan?"

"Why, of course, dear," grinned the apparition.

"And I repeat, I am far from helpless," said the Disciple.

Feeling harassed, Frank shook his head stubbornly. "No! I can't allow it! I wouldn't be able to protect both of you, spread

so far apart. This is why I only bring one person at a time." "And I should have known better, he added to himself.

"I can not help that. This is different. I must talk with Father Teddison."

With a shrug of dismissal, the Disciple walked off. In bitter desperation, Frank drew the pistol at his hip. He pointed it at the Disciple's back.

"I would rather shoot you myself, Delgado, than let Proteus take you."

Helen Navgy gasped.

Disciple Delgado stopped and turned. His eyes narrowed on the gun. "A slug thrower? I am protected against such weapons. And if you fire on me, I will be forced to kill you." A sleek, pistol-like weapon suddenly appeared in his hand, from up his sleeve apparently. Frank recognized it as a laser.

Frank nodded and put away his gun. At the same time the Disciple's laser disappeared.

"Your concern is puzzling, Mr. Daemon. But I will remember it."

"And I have a witness that the responsibility is no longer mine."

"I see. So you do." And he turned and strode off.

Frank found Helen Navgy staring at him with an expression of trouble. Her gaze switched to follow the retreating form of the Disciple.

"Is it really that dangerous?"

"Yes."

"Then we had better go with him, hadn't we? He is much more important than I am." She brightened considerably. "Besides, Lathan says I will meet Able further on. Won't I, dear?"

The apparition smiled broadly and held out an arm for her to take. "Of course, Helen. Come, let us take a walk."

Helen Navgy stepped forward, but stopped, contrite, at Frank's admonition.

"I keep forgetting he is not really Lathan. I'm sorry." To the apparition she said, "Lathan, I'm going to see Able now. But I will stop on the way back and say goodbye."

Lathan Navgy nodded, seeming comfortable with the decision. "Very well, Helen."

Who the hell is Able? Frank wondered. He realized he had missed a large chunk of their earlier conversation. It was another indication that the situation was out of control.

PHILIP DELGADO APPROACHED THE APPARITION of Father Teddison, with mixed feelings. Here was a man he had never expected to see again; a man he would have been happy never to see again. But there was a nostalgic quality, too. Twenty years of tutelage under the old man could not be dismissed so easily, not with the mixture of memories and associations the sight of him brought back. The sharp sting of loneliness pierced through him.

What am I doing here, he thought on this planet they should have named Vulcan? The ash from hundreds of volcanos sears my lungs, and hazes the sky so that it seems a perpetual twilight to me. And the dim star they call the sun is not even a light in the naked eye, night sky of Earth. Will I really begin to see the beauty of it, as Saxton says?

At the back of his mind, the voice of his conscience was yammering; had been yammering since he had seen the first apparition. He ignored it, with difficulty, because he was still curious. The voice would not stop yelling until he made what it considered a correct decision.

He stopped at a respectable distance from Father Teddison. The likeness was incredible! The white, unmanageable hair, that tic along the clinched jaw, and the dark, ever angry eyes. The old feeling of inadequacy returned, the feeling he thought he had left behind on Earth. He longed to advance and hit the man—anything to alter the perpetual look of scorn. His

conscience, though, warned against it.

"What are you staring at, Philip?"

"The ugly, unlikely image of Father Alvin Teddison, Proteus."

The dark eyes flashed. "So, you stoop to insult now? That was never one of your faults in the past, at least."

"Oh, the fault was there, it's just that the expression comes easier now."

Father Teddison grunted. Ignoring Philip, he surveyed the beautiful desolation of Phantom's Hell. Philip could see the aversion the old man had for what he saw; the distrust. Father Teddison rubbed the side of his nose with a finger. It was an habitually unconscious gesture, a private indication of impatience.

"Why did you come here, Philip? It should have been obvious to you that evil existed here, merely from hearing the attributes of this thing. I thought I had taught you to make those kinds of decisions instantly."

Philip hesitated, defensively seeking the reasons that had seemed so clear until now. "I received mixed reports on this thing, Father. And the decision of my predecessor here, Empire's Disciple Saxon, had to bear weight. He has adopted a position of neutrality."

"Empire's Disciple Saxon?" Father Teddison sneered. "He is that in name only. He is no more than any other man, now. After fifty years, his conscience has surely died."

Philip's thoughts went oblique. *Fifty years Saxon has been here, and over fifty years I've been traveling. Which means that my replacement must already have left Earth.* He shivered. It was a small thing, but it dramatically forced an emotional realization of the great distance and time involved in the Universal Church's control of its Empire. And it accentuated his homesickness.

He answered stiffly. "Nevertheless, I felt personal observation was called for."

"You always were too damned curious, Philip. It's a trait that is not suited to a good Disciple. Duty! Duty is the prime imperative for you, boy. You are the weakest link in the Church's control of the Empire. Therefore, you must be strong, and strength comes from strict adherence to duty."

"Yes sir, I know."

"Well?"

"I also have my own doubts to satisfy. Mrs. Navgy has shown me that Proteus need not be evil."

"The good bring good with them. You have not yet seen what this place has done to Frank Daemon."

Philip jerked and looked with horror at the thing that resembled Father Teddison. *My multifaceted God!* he thought. *What am I doing? It's so easy to be lulled, so easy to believe. And what is this strange game this Proteus monster is playing with me?*

"What is it that has happened to Frank Daemon here?" he asked.

The apparition of the priest shrugged as if the question were suddenly of no interest. "No doubt you will discover that for yourself soon enough."

"I see." He hoped his tone was sardonic.

"You know what must be done here, Philip!" The anger was stronger—righteous indignation. "This is an alien horror! It reacts in evil ways with the minds of men. It cannot be allowed to continue. Isn't your conscience even now demanding an end to this?"

"Yes," he said, dimly aware of the approach of Frank and Mrs. Navgy.

"Then you must not delay. Strength in duty, son. Proteus must be destroyed." Suddenly he seemed to soften, to become truly fatherly, something Philip had seen only twice in his life. "Come, I will show you the way."

"Nol!" came the shout from behind. "Shut up, you stupid—"

Frank Daemon ran toward them, his expression wild. Visibly

he fought to retain control of himself.

"Proteus," he said, straining for calm, "be gone!"

For an instant Philip thought he saw the form of Father Teddison waver. Then it was back again. Except that it wasn't quite Father Teddison. The apparition now seemed to contain the mingled aspects of two people. It laughed.

"You can't send me away now, Frank," it said. "You are too emotional. Are you going to show Disciple Delgado what you usually do when that happens?"

Frank grabbed the Disciple's arm. "Don't listen to what he is saying. He is simply trying to gain your trust. He sacrifices everything for the moment, do you understand?"

"You mean it's stupid."

"In that way, yes."

"Nevertheless, Mr. Daemon, I find its advice quite sound."

"Disciple . . ." Frank took a deep breath. "Disciple, you can't destroy Proteus. For God's sake man, he's the first authentic example of telepathy in the known universe. Instead of killing him, we should be studying him!"

"The fact that Proteus is telepathic is not a point in your favor, Frank."

Frank Daemon's expression grew ugly with disgust. "Oh yes, I forgot. Proteus is alien and possesses a talent that might be a threat to your precious goddamned Empire."

"I wonder what your real reasons are for wanting to protect Proteus?" the Disciple asked. "I suspect they are much more personal than you would admit."

"That's not true! I—"

The apparition laughed. The duality it projected was more pronounced. Philip saw that the second person was a woman.

"He doesn't believe you, Frank," the apparition giggled. "You must do better for me."

Frank went white. With a smooth motion, that must have been long practiced, he drew his gun and shot the apparition in the face.

The dual projection abruptly vanished. There was only Father Teddison standing there with a blood-messy face. He slumped to the ground.

HELEN NAVGY WAS DISTRESSED. Frank Daemon was becoming erratic, unstable—saying things he should not. And Disciple Delgado was just as bad, so distant and cruel. She wished she were back with Lathan, hearing his gentle humor. She looked around to find him, but he had disappeared. She felt his loss more painfully than at any time in years.

Distractedly, she wandered away, though not far because Frank's warnings had impressed her. She stood now some fifty meters away from the two men and the apparition of that angry looking priest. Before he was a small mud hole and the bubbling of its viscous earth fascinated her. The rotten egg stench was awful but she was able to ignore it.

Then from her right came a small, frightened voice.

"Aunt Helen, I'm scared."

"Able!" Helen whispered. The sight of her long-dead nephew slipped past the guard she had set herself to keep. The boy had only been six when—She stopped thinking that.

"Please, Aunt Helen."

Able's tangle of dark hair floated in the breeze, the same as in that vivid memory. But his shoulders were hunched and he kept looking at the tableau behind her with dread.

"What's wrong, Able? What is it?"

"I'm afraid, Aunt Helen. Those men frighten me. They're going to hurt me."

Almost she took a step forward. "No one will hurt you, Able. I promise."

Suddenly there was the report of a gun. She twisted to see the white-haired priest falling to the ground. Frank Daemon still was pointing the weapon at him.

"Oh, God!" she said, and instinctively ran forward to pick [Continued on page 79]



THE RINGWORLD ENGINEERS

Larry Niven

Part 3

Synopsis

The Story Thus Far

The Ringworld's attitude jets—Bussard ramjets, mounted on the rim wall, burning the solar wind as a fusion drive—are 95% missing. The remaining motors cannot hold the Ringworld against its own instability. The Ringworld will grind against its sun in two years.

The intelligent move would be to get off.

Unfortunately, the **Hindmost** controls the expedition. **Louis Wu** and **Chmeee** are no more than kidnap victims assigned to explore. The puppeteer would probably leave without them if faced with *any* immediate threat. Worse: Louis's *kaín* crewmate, Chmeee, left Louis on foot after Louis succumbed to a vampire's wiles. Louis thinks he knows where Chmeee went. It's no help.

He left Louis some equipment; and Louis's only ally, one of the Machine People species, has an alcohol-powered van. **Valavirgillina** is bound by trade agreements with Louis.

She would like to believe that his claims are insane. This is no longer possible. The Ringworld is doomed, and she knows it.

If Louis could find the Ringworld's hypothetical Repair and Control Center, he would conceivably find a way off, or a way to control the Hindmost, or even a way to save the Ringworld. There may be records of its location in the City Builders' ancient floating city.

Larry Niven

THE SHADOW FARM



HEY BEGAN TO PASS OTHER VEHICLES: large or small windowed boxes, each with a smaller box at the rear. The road widened and became smoother. Now the fueling stations were more frequent, of sturdy square Machine People architecture. There were more and more boxy vehicles, and Vala had to slow. Louis felt conspicuous.

The road topped a rise, and the city was beyond. Vala played tour director as they drove downhill through growing traffic.

River's Return had first seen life as a string of docks along the spinward shore of the broad brown Serpent River. That core region now had the look of a slum. The city had jumped the river via several bridges, and expanded into a circle with a piece bitten out of it. That missing piece was the shadow of the City Builders' floating city.

Moving boxes surrounded them now. The air was scented with alcohol. Vala slowed to a crawl. Louis hunched low. Other drivers had ample opportunity to peer in at the strangely built man from the stars.

But they didn't. They saw neither Louis nor each other; they seemed to see only other vehicles. And Vala drove on, into the center of town.

Here the houses crowded each other. They stood three and four stories tall, and narrow, with no space between. They pushed out above the street, cutting into the daylight. Public buildings were in marked contrast, all low and sprawling and massive, situated on ample grounds. They competed for ground, not for height; never for height, with the floating city hovering over all.

Vala pointed out the merchants' school, a wide complex of prosperous stone buildings. A block later she pointed down a cross street. "My home is that way, in pink poured stone.

See?"

"Any point in going there?"

She shook her head. "I thought hard on this. No. My father would never believe you. He thinks that even the City Builders' claims are mostly boastful lies. I thought so too, once, but from what you tell me of this... Halvopillar..."

Louis laughed. "She was a liar. But her people did rule the Ringworld."

They left River's Return and continued to port. Vala drove several miles further before crossing the last of the bridges. On the far, portward side of the great shadow, she left an almost invisible side road and parked.

They stepped out into too-bright sunlight. They worked almost in silence. Louis used the flying belt to lift a fair-sized boulder. Valavirgillin dug a pit where it had been. Into the pit went most of Louis's share of the fine black cloth. The dirt went back into the pit, and Louis lowered the boulder on it.

He put the flying belt into Vala's backpack and shouldered it. The pack already held his impact suit, vest, binoculars, flashlight-laser, and the flask of nectar. It was lumpy and heavy. Louis set the pack down, adjusted the flying belt to give him some lift. He set the translator box just under the cover and shouldered the pack again.

He was wearing a pair of Vala's shorts, with a length of rope to hold them up. They were too big for him. His depilated face would be taken as natural to his race. Nothing about him now suggested the star traveller, except the ear plug for his translator. He'd risk that.

He could see almost nothing of where they were going. The day was too bright, the shadow was too extensive and too dark.

They walked from day into night.

Vala seemed to have no trouble picking her path. Louis followed her. His eyes adjusted, and he saw that there were narrow paths among the growths.

The fungi ranged from button size to asymmetrical shapes as tall as Louis's head, with stalks as thick as his waist. Some were mushroom-shaped, some had no shape at all. A hint of corruption was in the air. Gaps in the sprawl of buildings overhead let through vertical pillars of sunlight, so bright that they looked solid.

Frilly yellow fungus fringed in scarlet half-smothered an outcropping of gray slate. Medieval lances stood upright, white tipped with blood. Orange and yellow and black fur covered a dead log.

The people were almost as varied as the fungi. Here were Runners using a two-handed saw to cut down a great elliptical mushroom fringed in orange. There, small broad-faced people with big hands were filling baskets with white buttons. Grass Giants carried the big baskets away. Vala kept up a whispered commentary. "Most species prefer to hire themselves in groups, to protect against culture shock. We keep separate housing."

There, a score of people were spreading manure and well-decayed garbage; Louis could smell it from a fair distance away. Were those Vala's species? Yes, they were Machine People, but two stood aside and watched, and they held guns. "Who are those? Prisoners?"

"Prisoners convicted of minor crimes. For twenty or fifty *fanans* they serve society in this—" She stopped. One of the guards was coming to meet them.

He greeted Vala. "Lady, you should not be here. These shit-handlers may find you too good a hostage."

Vala sounded exhausted. "My car died. I have to go to the school and tell them what happened. Please, may I cross the shadow farm? We were all killed. All killed by vampires. They have to know. Please..."

The guard hesitated. "Cross, then, but let me give you an escort." He whistled a short snatch of music, then turned to Louis. "What of you?"

Vala answered for Louis. "I borrowed him to carry my pack."

The guard spoke slowly and distinctly. "You. Go with the lady as far as she likes, but stay in the shadow farm. Then go back to what you were doing. What were you doing?"

Louis was mute without the translator. He thought of the flashlight-laser buried in his pack. Somewhat at random he laid his hand on a lavender-fringed shelf fungus, then pointed to a sledge stacked with similar fungi.

"All right." The guard looked past Louis's shoulder. "Ah."

The smell told Louis before he turned. He waited, docile, while the guard instructed a pair of ghouls: "Take the lady and her porter to the far edge of the shadow farm. Guard them from harm."

They walked single file along the paths, tending toward the center of the shadow farm. The male ghoul led, the female trailed. The smell of corruption grew riper. Sledges of fertilizer passed them on other paths.

Blood and tanji! How was he going to get rid of the ghouls?

Louis looked back. The ghoul woman grinned at him. She certainly didn't mind the smell. Her teeth were big triangles, well designed for ripping, and her goblin ears were erect, alert. Like her mate, she wore a big purse on a shoulder strap, and nothing else, save for the thick hair that covered most of their bodies.

They reached a broad arc of cleared dirt. Beyond was a pit. Mist stood above the pit, hiding the far side. A pipe poured sewage into the pit. Louis's eyes followed the pipe up, into the black, textured sky.

The ghoul woman spoke in his ear, and Louis jumped. She was using Machine People speech. "What would the King Giant think if he knew that Louis and Wu were one?"

Louis stared.

"Are you mute without your little box? Never mind. We are at your service."

The ghoul man was talking to Valavirgillin. She nodded. They moved off the path. Louis and the woman followed them around an extensive white shelf fungus, to huddle under its far lip.

Vala was edgy. The smell might be getting to her; it was certainly getting to Louis. "Kyeref says this is fresh sewage. In a *fanan* it'll be ripe and they'll move the pipe and start hauling it away for fertilizer. Meanwhile nobody comes here."

She took the pack off Louis's back and spilled it out. Louis reached for the translator (the ghouls' ears came sharply alert as his hand neared the flashlight-laser) and turned up the volume. He asked, "How much do the Night People know?"

"More than we ever thought." Vala looked like she wanted to say more, but she didn't.

The male answered. "The world is doomed to fiery destruction in not many *fanans*. Only Louis Wu can save us." He smiled, showed a daunting expanse of white wedge-shaped teeth. His breath was that of a basilisk.

"I can't tell if you're being sarcastic," Louis said. "Do you believe me?"

"Strange events can spark an urge to prophecy in the insane. We know that you carry tools not known elsewhere. Your race is not known, either. But the world is large, and we do not know all of it. Your furry friend's race is stranger yet."

"That's not an answer."

"Save us! We dare not interfere." The ghoul lost a little of his grin, though his lips still didn't meet. (That would take a conscious effort. Those big teeth...) "Why should we care if you are insane? The activities of other species rarely interfere with our own lives. In the end they all belong to us."

"I wonder if you aren't the real rulers of the world." Louis said that for diplomatic relations, then wondered uneasily if it might be true.

The woman answered. "Many species may claim to rule the world, or their own part of it. Would we lay claim to the forest tops of the Hanging People? Or the airless heights of the Spill Mountain People? And what species would want our domain?" She was laughing at him, that was certain.

Louis said, "There's a Repair Center for the world,

THE RINGWORLD ENGINEERS

somewhere. Do you know where?"

"No doubt you are right," the male said, "but we do not know where it might be."

"What do you know about the rim wall? and the Great Oceans?"

"There are too many seas. I know not which you mean. There was activity along the rim wall before the great flames first appeared."

"Was there? What kind of activity?"

"Many lifting devices raised equipment beyond even the level of the Spill Mountain People. There were City Builders and Spill Mountain People in great number, many other species in lesser number. They worked right at the upper edge of the world. Perhaps you can tell us the meaning of it all."

Louis was dazed. "Tanj dammit. They must have been—" Remounting the attitude jets, and he probably didn't want to say so. So much power and ambition, so close, would be bad for a puppeteer's nerves. "That's a long way for carrion-eaters to pass messages."

"Light travels further than that. Does this news affect your predictions of doom?"

"I'm afraid not." There might well be a repair crew in action somewhere, but they had almost run out of Bussard ramjets to be remounted. "But with the great flames acting, we should have more than the seven or eight *falan*s I thought we had."

"Good news. What will you do now?"

For a moment Louis was tempted to abandon the floating city, deal strictly with the ghouls. But he'd come too far, and after all, there were ghouls everywhere. "I'll wait for night and then go up. Vala, your share of the cloth is in the vehicle. I'd be obliged if you don't show it to anyone, or tell anyone about me, for . . . a couple of turns should do it. My share you can dig up in a *falan*, if nobody comes for it. And I've got this." He patted a vest pocket, where a square yard of superconductor was folded into the bulk of a handkerchief.

"I wish you wouldn't take it to the city." Vala said.

"After all, they'll think it's just cloth unless I tell them different," Louis said. It was almost a lie. Louis intended to use the superconductor.

The ghouls stared when he took off his shorts—adding detail to his description, no doubt, to help them find his species' home on the Ringworld. He donned impact armor.

The female suddenly asked, "How did you convince a Machine People woman that you were sane?"

Vala told her, while Louis donned vest and goggles and pocketed the flashlight-laser. The ghouls almost lost their smiles. The woman asked, "Can you save the world?"

"Don't count on me. Try to find the Repair Center. Spread the word. Try questioning the bandersnatchi—the great white beasts who live in the great swamp to spinward."

"We know of them."

"Good. Vala—"

"I go now to tell how my companions died. We may not meet again, Louis," Valavirgillin picked up the empty pack and walked quickly away.

"We should escort her," the female ghoul said. They left.

They hadn't said "good luck." Why? The way they lived, they might all be fatalists. Luck would mean nothing to them.

Louis scanned the textured sky. He was tempted to go now, immediately. Better to wait for night. He spoke into the translator: "Hindmost, are you there?"

Apparently the puppeteer wasn't.

Louis stretched out under the shelf fungus. The air seemed cleaner near the ground. He sipped meditatively at the fuel-and-nectar bottle Vala had left him.

What were the ghouls? Their position in the ecology seemed very secure. How had they kept their intelligence? Why would they need intelligence? Perhaps they had to fight for their prerogatives on occasion. Or for respect. Or, complying with a thousand local religions could require considerable verbal facility.

Larry Niven

More to the point: how could they help him? Somewhere, was there a ghoulish enclave that remembered the source of the immortality drug—which, by hypothesis, was made from Pak *tree-of-life* root?

One thing at a time. Try the city first.

The pillars of light thinned, then faded out. Other lights appeared in the solid sky: hundreds of lighted windows. None showed directly above him. Who would occupy a basement above a garbage dump? (Someone who couldn't afford lighting?)

The shadow farm seemed deserted. Louis heard only the wind. Standing on the shelf fungus gave him a glimpse of distant windows flickering as if with firelight: housing for the farmers, around the perimeter.

Louis touched the lift knob on his flying belt and went up.

THE FLOATING CITY



T SOMETHING OVER A THOUSAND FEET THE smell of fresh air became more pronounced; and the floating city was around him. He circled the blunt tip of an inverted tower: four levels of dark windows, and a garage below that. The big garage door was closed and locked. Louis circled, looking for a broken window. There was none.

These windows must have survived for eleven hundred years. Probably he couldn't break one if he tried. He didn't want to enter the city as a burglar, anyway.

Instead, he let himself rise along the sewer pipe, hoping to gain privacy that way. There were ramps around him now, but no street lights anywhere. He guided himself to a walkway and settled on it. Now he felt less conspicuous.

There was nobody in sight. The broad ribbon of poured stone curved away among the buildings, left and right, up and down, putting out pseudopods at random.

With a thousand feet of empty space below, there were no guard rails. Hahlorplillar's people must be closer to their brachiating past than Earth's people. Louis strolled toward the lights, keeping nervously to the center of the walk.

Where was everybody? The city had an insular look, Louis thought. There was housing in plenty, and ramps between the housing areas, but where were the shopping centers, the playhouses, the bars, the malls, parks, sidewalk cafes? Nothing advertised itself, and everything was behind walls.

Either he should find someone to introduce himself to, or he should be hiding. What about that glass slab with the dark windows? If he entered from above, he could make certain it was deserted.

Someone came down the walk toward him.

Louis called, "Can you understand me?" and heard his words translated into the Machine People tongue.

The stranger answered in the same language. "You should not walk about the city in darkness. You might fall." He was closer now. His eyes were huge; he was not of the City Builder species. He carried a slender staff as long as himself. With the light behind him Louis could see no more of him. "Show your arm," he said.

Louis bared his left arm. Of course it bore no tattoos. He said what he had planned to say from the beginning. "I can repair your water condensers."

The staff slashed at him.

It rapped his head glancingly as Louis threw himself backward. He rolled and was on his feet, crouching, trained reflexes working fine, with his arms coming up just too late to block the staff. It cracked against his skull. Lights flared behind his eyes and went out.

He was in free fall. Wind roared past him. Even to a man nearly unconscious, the connection was obvious. Louis thrashed in panic in the dark. *Blowout in a spaceship! Where am I? Where are the meteor patches? My pressure suit? The*

alarm switch?

Switch—He half-remembered. His hands leapt to his chest, found flying belt controls, twisted the lift knob hard over.

The belt lifted savagely and swung him around, feet down. Louis tried to shake the mists out of his head. He looked up. Through a gap in darkness he saw the solar corona glowing around a shadow-square; he saw hard darkness descending to smash him. He twisted the lift knob to stop his rapid rise.

Safe.

His belly was churning and his head hurt. He needed time to think. Clearly his approach had been wrong. But if the guard had rolled him off the walk—Louis patted his pockets; everything was there. Why hadn't the guard robbed him first?

Louis half-remembered the answer: he'd jumped, missed the guard, rolled, and passed out in midair. That put a different face on the matter. It might even have been best to wait. Too late now.

So try the other approach.

He swam beneath the city, outward toward the rim. Not too far. There were too many lights along the perimeter. But near the center was a double cone with no lights showing at all. The lower tip was blunt: a carport with a poured stone ledge protruding. Louis floated into the opening.

He raised the amplification of his goggles. It worried him that he hadn't done that earlier. Had the blow to his head left him stupid?

The Prill People/City Builders had had flying cars, he remembered. There was no car here. He found a rusted metal track along the floor, and a crude, armless chair at the far end, and bleachers: three rows of raised benches on each side of the track. The wood had aged, the metal was crumbly with rust.

He had to examine the chair before he understood. It was built to run down the track and to flop forward at the end. Louis had found an execution chamber, with provision for an audience.

Would he find courtrooms above? And a jail? Louis had about decided to try his luck elsewhere when a gravelly voice spoke out of the dark, in a speech he hadn't heard in twenty-three years. "Intruder, show your arm. Move slowly."

Again Louis said, "I can make your water condensers work," and heard his translator speak in Haliroprillalar's tongue. It must have been already in the translator, in storage.

The other stood in a doorway at the top of a flight of stairs. He was Louis's height, and his eyes glowed. He carried a weapon like Valavirgillin's. "Your arm is bare. How did you come here? You must have flown."

"Yes."

"Impressive. Is that a weapon?"

He must mean the flashlight-laser. "Yes. You see very well in the dark. What are you?"

"I am Mar Korssil, a female of the Night Hunters. Set down your weapon."

"I won't."

"I am reluctant to kill you. Your claim might be true—"

"It is."

"I am reluctant to wake my master, and I will not let you pass this door. Set down your weapon."

"No. I've been attacked once already tonight. Can you lock that door so that neither of us can open it?"

Mar Korssil tossed something through the door; it jingled as it struck. She closed the door behind her. "Fly for me," she said. Her voice was still a gravelly bass.

Louis lifted a few feet, then settled back.

"Impressive." Mar Korssil came down the stairs with her weapon at ready. "We have time to talk. In the morning we will be found. What do you offer, and what do you want?"

"Was I right in guessing that your water condenser doesn't work? Did it stop at the Fall of the Cities?"

"It has never worked to my knowledge. Who are you?"

"I am Louis Wu. Male. Call my species the Star People. I come from outside the world, from a star too dim to see. I have

stuff to repair at least some of the water condensers in the city, and I have hidden much more. It may be that I can give you lighting, too."

Mar Korssil studied him with blue eyes as big as goggles. She had formidable claws on her fingers, and buck teeth like axeheads. What was she, a rodent-hunting carnivore? She said, "If you can repair our machines, that is good. As to repairing those of other buildings, my master will decide. What do you want?"

"A great deal of knowledge. Access to whatever the city holds in the way of stored knowledge, maps, histories, tales—"

"You cannot expect us to send you to the Library. If your claim is true, you are too valuable. Our building is not wealthy, but we may buy knowledge from the Library, if you have specific questions."

It was becoming obvious: the floating city was no more a city than Pericles' Greece had been a nation. The buildings were independent, and he was in the wrong building. "Which building is the Library?" he asked.

"At the port-by-spinward perimeter, a cone moored tip down... why do you ask?"

Louis touched his chest, rose, moved toward the outer night.

Mar Korssil fired. Louis fell sprawling. Flames blazed against his chest. He yelled and jerked the harness loose and rolled away. The flying belt controls burned, a smoky yellow flame with blue-white flashes in it.

Louis found the flashlight-laser in his hand, pointed at Mar Korssil. The Night Hunter seemed not to notice. "Do not make me do that again," she said. "Are you wounded?"

Those words saved her life; but Louis had to kill *something*. "Drop the weapon or I slice you in half," he said, "like this." He waved the laser beam through the execution chair; it flamed and fell apart.

Mar Korssil didn't move.

"I only want to leave your building," Louis said. "You've marooned me. I'll have to enter your building, but I'll leave by the first ramp I find. Drop the weapon or die."

A woman's voice spoke from the stairway. "Drop the gun, Mar Korssil."

The Night Hunter did.

The woman came down the stairs. She was taller than Louis, and slender. Her nose was tiny, her lips invisibly thin. Her head was bald, but rich white hair flowed down her back from behind her ears and the back of her neck. Louis guessed that the white hair was a mark of age. She showed no fear of him. He asked, "Do you rule here?"

"I and my mate-of-record rule. I am Laliskareerlyar. Did you call yourself Luweewu?"

"Close enough."

She smiled. "There is a peephole. Mar Korssil signalled from the garage: an unusual act. I came to watch and listen. I am sorry about your flying device. There are none left in all the City."

"If I repair your water condenser, will you set me free? And I need advice."

"Consider your bargaining position. Can you resist my guards who wait outside?"

Louis had almost resigned himself to killing his way out. He made one more try. The floor seemed to be the usual poured stone. He ran the laser beam in a slow circle, and a patch of stone a yard across dropped into the night. Laliskareerlyar lost her smile. "Perhaps you can. It shall be as you say. Mar Korssil, come with us. Stop anyone who tries to interfere. Leave your gun where it lies."

They climbed a spiral escalator that no longer ran. Louis counted fourteen loops, fourteen stories. He wondered if he had been wrong about Laliskareerlyar's age. The City Builder woman climbed briskly, and had breath left over for conversation. But her hands and face were wrinkled as if worn too long.

An unsettling sight. Louis wasn't used to that. Intellectually he knew what it was: the sign of age, and the sign of her ancestor, the Pak protector.

They climbed by the light of Louis's flashlight-laser. People appeared at doorways; Mar Korssil warned them back. Most were City Builders, but there were other species, too.

These servants had served the Lyar family for many generations, Laliskareerlyar explained. The Mar family of night watchmen had been policemen serving a Lyar judge. The Machine People cooks had served almost as long. Servants and City Builder masters saw themselves as one family, bound by periodic *rishathra* and old loyalties. All told, Lyar Building held a thousand people, half of them interrelated City Builders.

Louis stopped to look through a window halfway up. A window, in a stairwell that ran through the core of a building? It was a hologram, a view along one of the rim walls, showing a vast stretch of Ringworld landscape. One of the last of the Lyar treasures, Laliskareerlyar told him with pride and regret. Others had been sold over hundreds of *salans*, to pay water fees.

Louis found himself talking, too. He was wary, and angry, and tired; but there was something about the old City Builder woman that drew him out. She knew about planets. She didn't question his veracity. She listened. She looked so much like Halrlorplillar that Louis found himself talking about her: about the ancient, immortal ship's whorl who had lived as a half-mad goddess until Louis Wu and his motley crew arrived; how she had helped them, how she had left her ruined civilization with them, how she had died.

Laliskareerlyar asked, "Is that why you didn't kill Mar Korssil?"

The Night Hunter woman looked at him with great blue eyes.

Louis laughed. "Maybe." He told them of his conquest of the sunflower patch. He was skirting a dangerous subject; for he saw no point in telling Laliskareerlyar that the world was going to brush against its sun. "I want to leave the world knowing that I've done no damage. I've got more of that cloth buried near here...tanji! I can't think of any way to reach it now."

They had reached the top of the spiral. Louis was huffing. Mar Korssil unlocked a door; there were more stairs beyond. Laliskareerlyar asked, "Are you nocturnal?"

"What? No."

"We had best wait for day. Mar Korssil, go and send us breakfast. Send Whil, with tools. Then go to sleep." As Mar Korssil trotted obediently downstairs, the old woman sat cross-legged on an ancient carpet. "I expect we must work outside," she said. "I don't understand the risk you took. For what? Knowledge? What knowledge?"

It was difficult lie to her; but the Hindmost might well be listening. "Do you know anything of a machine to change one kind of matter into another? Air into dirt, lead into gold?"

She was interested. "Ancient magicians were said to be able to turn glass into diamonds. But these were children's tales."

So much for that. "What of a Repair Center for the world? Are there legends about that? Telling its location?"

She stated. "As if the world were no more than a made thing, a larger version of the City?"

Louis laughed. "Much larger. Much much much larger. No?"

"No."

"What about an immortality drug? I know that's real. Halrlorplillar used it."

"Of course it was real. There is none left in the City, nor anywhere else that I know of. The tale is a favorite with—" The translator used an Interworld phrase. "—con men."

"Does the tale tell where it might have come from?"

A young City Builder woman came puffing up the stairs carrying a shallow bowl. Louis's fears of poison disappeared at once. The stuff was lukewarm, something like oatmeal, and

they ate with their hands from the one bowl.

"The youth drug comes from spinward," the old woman said, "but I know not how far to spinward. Is this the treasure of knowledge you came for?"

"Any of several treasures. That would be a good one." There would certainly have been *tree-of-life* in the Repair Center, Louis thought. I wonder how they'd handle it? No human being would want to be a protector, surely? But there might be hominids who would. Well, those puzzles could wait.

Whil was a burly hominid with a simian face, dressed in a sheet whose original color was lost to time. It was a mad god's rainbow now. Whil didn't talk much. His arms were short and thick and looked very strong. He led them up the last flight of steps, carrying his tool box, and out into the dawn.

They were on the lip of a funnel, at the truncated tip of the double cone. The rim was only a foot across. Louis's breath caught in his throat. With his flying belt dead, he had reason to fear heights. Wind whipped past him, whipped Whil's sheet into a fluttering multicolored flag.

Laliskareerlyar asked, "Well? Can you fix it?"

"Not from here. There must be machinery below."

There was, but it wasn't easy to reach. The crawlspace was inches wider than Louis Wu. Whil crawled ahead of him, opening panels, as instructed.

The crawlspace was doughnut-shaped, circling the machinery that must circle the funnel. And the water was supposed to precipitate on the funnel, no doubt. By refrigeration? Or had they something more sophisticated?

The wedgity concealed by the panels was tightly packed, and a total mystery to Louis Wu. It was sparkling clean, except for...yah. He peered closer, not breathing. A wire-thin wormtrail of dust had fallen through the wedgity. Louis tried to guess where it had fallen from. He'd have to assume the rest of the machinery was still functional.

He backed out. From Whil he borrowed thick gloves and a pair of needle-nosed pliers. He cut a strip from the edge of the black cloth in his vest and twisted it. He strung it between two contacts and fastened them.

Nothing obvious happened. He continued around the circle, following Whil. In all he found six wormtrails of dust. He fastened six twisted strips of superconductor where he thought they belonged.

He wriggled out of the crawlspace. "Of course, your power source could be long dead," he said.

"We must see," said the old woman. She went up the stairs to the roof. Louis and Whil followed.

The smooth face of the funnel seemed misted over. Louis knelt and reached to touch it. Wet. The water was warm. Already it was beading and flowing down slope to the pipes. Louis nodded thoughtfully. Another good deed that wouldn't matter in fifteen *salans*.

ECONOMICS IN LYAR

JUST BELOW THE THICK WAIST of Lyar Building was what seemed to be a combination audience chamber and bedroom: huge circular bed with a curtained canopy, couches and chairs around small and large tables, a picture window wall facing the nearer edge of the shadow farm, a bar built to offer a wide variety of potables. That variety was gone. Laliskareerlyar poured from a crystal decanter into a two-handled goblet, sipped, and passed it across to Louis.

He asked, "Do you hold audiences in here?"

She smiled. "Of a sort. Family gatherings."

Orgies? Very likely, if *rishathra* was what held the Lyar family together. A family fallen on hard times. Louis sipped from the goblet, tasted nectar-and-fuel. The sharing of cups and food dishes: was fear of poison behind that? But she did it naturally. And there were no diseases on the Ringworld.

"What you have done for us will increase our status and our funds," said Laliskareerlyar. "Ask."

"I need to reach the Library, enter it, and convince the people who rule there to let me make free use of all their knowledge."

"That would be very expensive."

"Not impossible? Good."

She smiled. "Too expensive. The relationship among the buildings is complicated. The Ten rule the tourist trade—"

"Ten what?"

"Ten large buildings. Luweewu, the most powerful among us. None still have lights and water condensers. Together they built the bridge to Sky Hill. Well, they rule the tourist trade, and they pay fees to the lesser buildings, to cover hospitality for their alien guests, the use of all public places, and special fees for events in private buildings. They make all agreements with other species, as with the water the Machine People pump up to us. We pay fees to the Ten for water and for special concessions. Yours would be a very special concession—although we pay the Library a general fee for education."

"The Library is one of the Ten?"

"Yes. Luweewu, we do not have the money. Is there a chance that you can do the Library a service? Perhaps your research would help them."

"It's possible."

"They would return some of the fee for a service rendered. Even more than we gave, possibly. But we don't have it. Would you sell them your light weapon, or the machine that talks for you?"

"I think I'd better not."

"Can you repair more water condensers?"

"Maybe. Did you say one of the Ten does not have a working water condenser? Then why are they one of the Ten?"

"Orly Building has been among the Ten since the Fall of the Cities. Tradition."

"What were they when the cities fell?"

"A military installation, a storehouse for weapons." She ignored Louis's chortling. "They have a fondness for weapons. Your light-projector—"

"I'd be afraid to let it go. But maybe they'd like their water condenser fixed."

"I will learn what fee they ask to let you into Orly Building."

"You're joking."

"No. You must be guarded, to prevent your carrying away weapons. You pay an entertainment fee to see the ancient weapons, and more if they are to be demonstrated. If you see their maintenance facilities you may learn weaknesses. I will ask." She stood. "Shall we indulge in *rishathra?*"

Louis had been expecting that, a little; and it wasn't Laliskareerlyar's odd appearance that made him hesitate. It was the terror of taking off his armor and his tools. He remembered an old sketch of a king brooding on his throne. *I'm paranoid. But am I paranoid enough?*

But he was far overdue for sleep! He was simply going to have to trust the Lyars. "Good," he said. He began to strip off his armor.

Age had treated Laliskareerlyar oddly. Louis knew ancient literature, plays and novels that predated boosterspice. Age was a crippling disease, but this woman wasn't crippled. Her skin was loose on her, and her limbs didn't bend as far as Louis's. But she had an endless interest in love, and in the strangeness of Louis's body and reflexes.

It was a long time before he slept. He had begged off telling her about the plastic under his hair. He wished she hadn't reminded him of that. The Hindmost had a working droud, and he hated himself for wanting it.

He was awakened near nightfall. The bed jolted twice, and he blinked and rolled over. He faced Laliskareerlyar and a City Builder man who had also been touched by age.

Laliskareerlyar introduced him as Fortalarispiyar, her mate-of-record and Louis's host. He thanked Louis for his work on the building's old machinery. Dinner was already on one of the tables, and Louis was invited to share it with them: a large bowl of stew, too bland to Louis's taste. He ate.

"Orly Building asks more than we have," Fortalarispiyar told Louis. "We have bought for you the right to enter three of our neighbors' buildings. If you succeed in repairing even one of their water condensers, we can get you into Orly Building. Is that satisfactory?"

"Excellent. I need machines that haven't worked in eleven hundred years, and haven't been tampered with, either."

"My mate told me."

Louis left them to their sleep as dark was falling. They had invited him to join them, and the great bed was roomy enough, but Louis was slept out and restless.

The great building was like a tomb. From the upper floors Louis watched for activity in the maze of bridges. He saw nothing but an occasional big-eyed Night Hunter. It figured. If the City Builders slept ten hours out of thirty, it might as well be during the dark. He wondered if they were all asleep in the lighted buildings, too.

"Calling the Hindmost," he said.

"Yes, Louis. Must we translate?"

"No need, we're alone. I'm in the floating city. It'll take me a day or two to get into the Library. I think I'm marooned here. My flying belt's ruined."

"Chmee still will not answer."

Louis sighed. "What else is new?"

"In two days my first probe will complete its circuit of the rim wall. I can bring it to the floating city. Will you want me to negotiate directly with the inhabitants? We are good at that. At least I can lend credence to your tale."

"I'll let you know. What about the Ringworld attitude jets? Have you found any more mounted?"

"No. Of those you know of, all twenty-one are firing. Can you see them?"

"Not from here. Hindmost? Can you learn anything about the physical properties of *scrith*, Ringworld floor material? Strength, flexibility, magnetic properties?"

"I have been working on that. The rim wall is available to my instruments. *Scrith* is very much denser than lead. The *scrith* floor of the Ringworld is probably less than a hundred feet thick. I'll show you my data when you return."

"Good."

"Louis, I can give you transportation, if need be. It would be easier if I could send Chmee."

"Great! What kind of transportation?"

"You will have to wait for my probe. I will give further instructions then."

He watched the nearly empty city for awhile after the Hindmost hung up. He felt depressed. Alone in a gone-to-seed building in a gone-to-seed city, without his droud—

A voice behind his shoulder said, "You told my mistress that you are not nocturnal."

"Hello, Mar Korssil. We use electric lighting. Some of us keep strange hours. Anyway, I'm used to a shorter day." Louis turned around.

The big-eyed humanoid wasn't pointing her weapon at Louis, exactly. She said, "These past *farans*, the day had been changing its length. It is distressing."

"Yah."

"Who did you speak to?"

"A two-headed monster."

Mar Korssil departed. Perhaps she was offended. Louis Wu remained at the window, free-associating through the memories of a long and eventful life. He had given up hope of returning to known space. He'd given up the droud. Perhaps it was time to give up more.

Chkhar Building was a poured stone slab covered in balconies.

THE RINGWORLD ENGINEERS

Explosions had scarred one side of the building, exposing the metal skeleton in places. The water condenser was a trough along the top, slightly canted. An old explosion had sprayed metal droplets into the machinery below. Louis didn't expect his repairs to work, and they didn't.

"Mine is the blame," Laliskareerlyar said. "I had forgotten that Chka Building fought with Orly Building two thousand falans ago."

Panth Building was built like an onion standing on its tip. Louis guessed that the building had started life as a health club; he recognized pools, spas, hotboxes, massage tables, a gymnasium. The place seemed to have plenty of water—and a faint, half-familiar smell tickled at his memory.

Panth had also fought with Orly. There were craters. The bald young man named Arrivercompanth swore that the water condenser had never been damaged. Louis found the dust tracks in the machinery, and the contacts above them. When he had made his repairs, there were water droplets forming on the rounded roof and running into a gutter.

There was some difficulty about payment. Arrivercompanth and his people wanted to offer *rishathra* and promises. (And then Louis recognized the scent tickling his nose and hindbrain. He was in a house of ill repute, and there were vampires somewhere about.) Laliskareerlyar wanted cash, now. Louis tried to follow her argument. He gathered that the Ten would be unhappy when Panth stopped buying water, and only too happy to levy a fine against them for fraud. Arrivercompanth paid.

Gisk had been a condominium, or something similar, at the Fall of the Cities. It was cube with an air well down the center, and it was half empty. Judging by the smell of the place, Gisk had been restricting its use of water overmuch. Louis was learning the look of water repair machinery. He made his repairs quickly, and they worked. The Gisks paid at once. They fell at Laliskareerlyar's feet to express their thanks, ignoring her tool-wielding servant. Oh, well.

Fortaralispiyar was delighted. He packed a double handful of metal coins into Louis's vest, and explained the tricky etiquette of bribery. The face-saving language would strain his translator to the limits. "When in doubt, don't," Fortaralispiyar told him. "I will come with you to Orly Building tomorrow. Let me do the bargaining."

Orly Building was on the port side of the city. Louis and Fortaralispiyar took their time, sightseeing, walking the highest ramps to get a better view. Fortaralispiyar was proud of his city. "A bit of civilization remained even after the Fall," he said. He pointed out Rylo, that had been an emperor's castle. It was beautiful, but scarred. The emperor had tried to claim the city for his own, about the time Orly Building arrived. A fluted column like a Greek pillar, supporting nothing but itself, was Chank, which had been a shopping center. Without the supplies aboard Chank—from markets, restaurants, clothing and bedding stores, even toy shops for trading with the Machine People—the city would have died early. From the basement of Chank the air road spiralled down to Sky Hill.

Orly Building was a dark forty feet thick and ten times that wide, built along the lines of a pie. The massive tower at one edge, elaborated with gun emplacements and railed platforms and a derrick, reminded Louis of the bridge of a great ship—a battleship. The walkway to Orly was broad, but there was only one walkway and one entrance. Along the upper rim were hundreds of small projections. Louis guessed that they were cameras or other sensors, and that they no longer worked. Windows had been chopped into Orly's sides after the building was raised. The glass in them fitted poorly.

Fortaralispiyar was dressed in yellow and scarlet robes of what appeared to be vegetable fiber; coarse by Louis's standards, but grand from a distance. Louis followed him into Orly, into a large reception area. There was light, but it flickered: scores of alcohol lamps burning near the ceiling.

Eleven City Builder types of both sexes waited for them. They were dressed almost identically, in loose pants with tight cuffs and brightly colored capes. The edges of the capes were cut elaborately and without symmetry. Badges of rank? The white-haired man who came smiling to greet them wore the most elaborately cut cape, and a shoulder gun.

He spoke to Fortaralispiyar. "I had to see him for myself, this being who can give us water from machinery five thousand falans dead."

The handgun in his worn plastic shoulder holster was small, with clean, efficient lines; but even a gun couldn't make Filistranorly look warlike. His small features showed happy curiosity as he examined Louis Wu. "He seems unusual enough, but... well. You have paid. We shall see." He gestured to the soldiers.

They searched Fortaralispiyar, then Louis. They found his flashlight, tested it, gave it back. They puzzled over his translator until Louis said, "That speaks for me."

Filistranorly jumped. "So it does! Will you sell that?" He was speaking to Fortaralispiyar, who answered, "It is not mine."

Louis said, "I would be mute without it." Orly's master seemed to accept this.

The water condenser was a dip in the center of Orly's broad roof. The access tubes below were too small for Louis. Even if he took off his armor he wouldn't fit; and he didn't intend to do that. "What do you use for repairmen? Mice?"

"Hanging People," Filistranorly said. "We must rent their services. Chib Building was to have sent them by now. Do you see any other problems?"

"Yes." By now the machinery was familiar enough: Louis had repaired three buildings and failed at a fourth. He could see what ought to be a pair of contacts. He looked for the dust below them, and it wasn't there. "Were there earlier attempts at repair?"

"I assume so. How would we know, after five thousand falans?"

"We'll wait for the repairmen. I hope they can follow orders." Tanjl! Somebody long dead had neutered things up by blowing the tell-tale dust tracks ways, but Louis was sure he could get his arms in there.

Filistranorly asked, "Would you care to see our museum? You've bought that right."

Louis had never been a weapons buff. He recognized some of the principles, if not the forms, behind the killing-tools in the glass cases and behind the glass walls. Most of them used projectiles or explosions or both. Some would throw strings of tiny bullets that exploded like small firecrackers in enemy flesh. The few lasers were massive and cumbersome. Once they must have been mounted on tractors or floating platforms; but those had been scavenged for use elsewhere.

A City Builder arrived with half a dozen workmen. The Hanging People stood as high as Louis's floating ribs. Their heads seemed too large for their bodies; their toes were long and dexterous, and their fingers nearly brushed the floor. "This is probably a waste of time," one said.

"Do it right and you'll be paid anyway," Louis told him. The little man sneered.

They wore armless gowns covered in pockets, the pockets heavy with tools. When the soldiers wanted to search them they stripped off the gowns and let the soldiers search those. Perhaps they didn't like to be touched.

So small. Louis whispered to Fortaralispiyar, "Does your species do *rishathra* with those?"

The City Builder chuckled. "Yes, but carefully."

The Hanging People clustered around Louis Wu's shoulders, peering, as he reached into the access tube. He wore the insulated gloves he'd borrowed from Mar Korssil. "These are what the contacts look like. Fasten the cloth strip thus... and thus. You should find six pairs of contacts. There may be a

wormtrack of dust below..."

After they had disappeared around the curve of the access tube, he told the masters of Orly and Lyar, "We'll never know if they make a mistake. I wish we could inspect their work." But he did not mention his other fear.

The Hanging People presently emerged. They all trooped up onto the roof: workers, soldiers, masters, and Louis Wu. There they watched as mist formed and condensed and water ran toward the center of the dip.

And six Hanging People now knew how to repair water condensers with strips of black cloth.

"I want to buy that black cloth," Filistranorly said.

The Hanging People and their City Builder master were already disappearing down the stairwell. Filistranorly and ten soldiers blocked Louis and Fortaralispolyar from that escape route.

"I don't intend to sell," Louis said.

The silver-haired soldier said, "I hope to keep you here until I can persuade you to sell. If pressed, I will insist that you sell the talking box, too."

Louis had half-expected this. "Fortaralispolyar, would Orly Building keep you here by force?"

Lyar's master looked Orly's master in the eye as he said, "No, Louis. The complications would be unpleasant. The lesser buildings would join to free me. The Ten would become the Nine rather than face a boycott on guests."

Filistranorly laughed. "The lesser buildings would grow thirsty—and his smile vanished as Fortaralispolyar's grew. Lyar Building had water to give away, now.

"You could not hold me. Guests would be pushed from the ramps. The dramas in Chkar and the facilities in Panth would be closed to you—"

"Go, then."

"I take Louis."

"You do not."

Louis said, "Take the money and go. It'll make things easier for all concerned." His hand was in his pocket, on the flashlight-laser.

Filistranorly held out a small bag. Fortaralispolyar took it, counted the contents. He walked through the soldiers and descended the stairway. When he was out of sight, Louis pulled the hood of the impact suit over his head.

"I offer a high price. Twelve—" something untranslated. "You would not be cheated," Filistranorly was saying. But Louis backed toward the edge of the roof. He saw Filistranorly signal to the soldiers, and he ran.

The edge of the roof was a chest-high fence: zigzag iron spokes, carved to resemble elbow root. The shadow farm was far below. Louis ran along the fence, toward the walkway. The soldiers were close—but Filistranorly was standing back and firing his pistol. The roar was disconcerting, even terrifying. A slug slammed into Louis's ankle; the suit went rigid, and he rolled like a tumbled statue, picked himself up and ran again. As two soldiers threw themselves at him, he swung over the fence and dropped.

Fortaralispolyar was on the walkway. He turned, startled.

Louis landed flat on his face, in an impact suit gone rigid as steel. The form-fitting coffin supported him, but he was still stunned. Hands helped him to his feet before he really wanted to get up. Fortaralispolyar put his shoulder under Louis's armpit and began walking them away.

"Get away. They might shoot," Louis gasped.

"They would not dare. Are hurt? Your nose is bleeding."

"It was worth it."

T

HEY ENTERED THE LIBRARY via a small vestibule in the bottom of the cone, the tip.

Behind a wide, massive desk, two librarians worked at reading screens: bulky machines, styled like a cluster of boxes, that used book tapes rolling through a reader. The librarians looked like a priest and priestess in identical

blue robes with jaggedly cut collars. It was some minutes before the woman looked up.

Her hair was pure, clean white. Perhaps she'd been born with white hair; because she wasn't old. A woman of Earth would have been about to take her first shot of boosterspice. She was straight and slender, and pretty, Louis thought. Flat-chested, of course, but nicely built. Hairloppillar had taught Louis to find a bald head and well-shaped skull sexy. If she would smile—but even to Fortaralispolyar she was rude and imperious.

"Yes?"

"I am Fortaralispolyar. Have you my contract?"

She tapped at the keyboard of the reading machine. "Yes. Is this the one?"

"He is."

Now she looked at Louis. "Luweewu, can you understand me?"

"I can, with the aid of this."

When the translator spoke her calm cracked, but only for a moment. She said, "I am Harkabeeparolyn. Your master has purchased your right to unlimited research for three days, with an option to purchase an additional three days. You may roam the Library at will, barring the residential sections, the doors marked in gold. You may use any machine unless it is marked thus." She showed him: an orange tic-tac-toe grid. "To use these you need help. Come to me or to anyone whose collar is cut like mine. You may use the dining room. For sleep or a bath you must return to Lyar Building."

"Good."

The librarian looked puzzled. Louis was a little startled himself. Why had he said that with such force? It struck him that Lyar Building felt more like home to him than the apartment on Canyon ever had.

Fortaralispolyar paid out silver coins, bowed to Louis and departed. The librarian turned back to her reading screen. (Harkabeeparolyn. He was tired of six-syllable names, but he'd better memorize it.) Harkabeeparolyn glanced around when Louis said, "There's a place I'd like to find."

"In the Library?"

"I hope so. I saw a place like it, long ago. You stood at the center of a circle, and the circle was the world. The screen at the center turned, and you could make any part of the world show big—"

"We have a Map Room. Climb the stairs all the way up." She turned away.

A tight spiral of metal stairs wound up the Library's axis. Anchored only at the top and bottom, it was springy under his weight as he climbed. He passed doors marked in gold, all closed. Higher up, arched openings led to banks of reading screens with chairs. Louis counted forty-six City Builders using reading screens, and two elderly Machine People, and a compact, very hairy male you-name-it, and a ghoul woman all alone in one room.

The top floor was the Map Room. He knew when he had reached it.

They had found the first Map Room in an abandoned floating palace. Its wall was a ring of blue mottled with white. There had been globes of ten oxygen-atmosphere worlds, and a screen that would show a magnified view. But the scenes it showed were thousands of years old. They showed a bustling Ringworld civilization: glowing cities, craft zipping through rectangular loops along the rim wall, aircraft as big as this Library, spaceship much bigger.

They had not been looking for a Repair Center, then. They'd been looking for a way off the Ringworld. Clearly the old tapes had been almost useless.

They'd been in too much of a hurry. So. Twenty-three years later, in another kind of desperation, we try again.

Louis Wu emerged from the stairwell with the Ringworld glowing around him. Where the sun would have been, there

was Louis Wu's head. The map was two feet tall and almost four hundred feet in diameter. The shadow squares were the same height, but much closer in, hovering over a thousand square feet of jet black floor flecked with thousands of stars. The ceiling, too, was black spattered with stars.

Louis walked toward one of the shadow squares, and through it. Holograms, right, as with that earlier Map Room. But this time there were no globes of Earthlike worlds.

He turned to inspect the back of a shadow square. No detail showed: nothing but a dead-black rectangle, slightly curved.

The magnification screen was in use.

A three-foot-by-two-foot rectangular screen, with controls below, was mounted on a circular track that ran between the shadow squares and the Ringworld. The boy had an expanded view of one of the mounted Bussard ramjets. It showed as a glare of bluish light. The boy was trying to squint past it.

He must have just reached adolescence. Very fine brown hair covered his entire scalp, thickening at the back. He wore a librarian's blue robes. His collar was wide and square, almost a cape, with a single notch cut into it.

Louis asked, "May I look over your shoulder?"

The boy turned. His features were small, nearly unreadable, as with any City Builder. It made him look older. "Are you allowed such knowledge?"

"Lyar Building has purchased full priveleges for me."

"Oh." The boy turned back. "We can't see anything anyway. In two days they'll turn off the flames."

"What are you watching?"

"The repair crew."

Louis squinted into the glare. A storm of blue-white light filled the screen, with darkness at its core. The attitude jet was a dim pinkish dot at the center of the darkness.

Electromagnetic lines of force gathered the hot hydrogen of the solar wind, guided and compressed it to fusion temperatures, and fired it back at the sun. Machinery strove with single-minded futility to hold the Ringworld against the gravity of its star. But this was all that showed: blue-white light and a pinkish dot on the line of the rim wall.

"They're almost finished," the boy said. "We thought they'd call us for help, but they never came." He sounded wistful.

"Maybe you don't have the tools to hear them calling." Louis tried to keep his voice calm. *Repair crew!* "They must be finished anyway. There aren't any more motors."

"No. Look—" The boy set the view zipping along the rim wall. The view stopped, jarringly, well beyond the blue glare. Louis saw bits of metal falling along the rim wall.

He studied them until he was certain. Bars of metal, a great spool-shaped cylinder—those were the dismantled components of what he had seen through *Needle's* telescope. That was the scaffolding for remounting the Ringworld's attitude jets.

The repair crew must have decelerated this equipment to solar orbital speed by using a segment of the rim transport system. But how did they plan to reverse the procedure? The machinery would have to be accelerated to Ringworld rotational speed at its destination.

By friction with the atmosphere? Those materials could be as durable as *scrift*. If so, heating would not be a problem.

"And here." The view skidded again, spinward along the rim wall to the spaceship ledge. The four great City Builder ships showed clear. *Hot Needle of Inquiry* was a speck. Louis would have missed it if he hadn't known just where to look: a mile from the only ship that still sported a Bussard ramjet around its waist.

"There, you see?" The boy pointed to the pair of copper-colored toroids. "There's only one motor left. When the repair crew mounts that, they'll be finished."

Megatons of construction equipment were falling down the rim wall, no doubt accompanied by hordes of construction men of unknown species, all aimed at *Needle's* parking space. The Hindmost would not be pleased.

Larry Niven

"Finished, yes," Louis said. "It won't be enough."

"Enough for what?"

"Never mind. How long have they been working, this repair team? Where did they come from?"

"Nobody wants to tell me anything," the boy said. "*Flup. Odorous flup.* What's everybody so excited about? Why am I asking you? You don't know, either."

Louis let that pass. "Who are they? How did they find out about the danger?"

"Nobody knows. We didn't know anything about them till they started putting up the machines."

"How long ago?"

"Eight *farans*."

Fast work, Louis thought. Just over a year and a half, plus whatever time it took them to get ready. Who were they? Intelligent, quick, decisive, not overwhelmed by large projects and large numbers...they might almost be...but the protectors were long gone. They had to be.

"Have they done other repairs?"

"Teacher Wilp thinks they've been unblocking the spillpipes. We've seen fog around some of the spill mountains. Wouldn't that be a big thing, unblocking a spillpipe?"

Louis thought about it. "Big all right. If you could get the seabottom dredges going again. You still have to heat the pipes. They run under the world. The seabottom ooze in a blocked pipe would freeze, I think."

"*Flup*," said the boy.

"What?"

"The brown stuff that comes out of a spillpipe is called *flup*."

"Oh."

"Where are you from?"

Louis grinned. "I came from the stars, in *this*." He reached past the boy's shoulder to point out the speck that was *Hot Needle of Inquiry*. The boy's eyes grew big.

More clumsily than the boy had, Louis ran the view along the path the lander had taken since leaving the rim wall. He found a continent-sized expanse of white cloud where the sunflower patch had been. Farther to port was a wide green swamp, and a river that had cut out a new bed, leaving the old as a twisting brown track through the yellow-brown desert. He followed the dry river bed. He showed the boy the city of vampires; the boy nodded.

The boy wanted to believe. *Men from the stars, come to help us!* Yet he was afraid to look gullible. Louis grinned at him and continued.

The land turned green again. The Machine People road was easy to follow; in most places the land was clearly different to either side. Here the river curved back to join its old bed. He ran the scale up again and was looking down on the floating city. "Us," he said.

"I've seen that. Tell me about the vampires."

Louis hesitated. But after all, the boy's species was this world's experts at interspecies sex. "They can make you want to do *rishathra* with them. When you do, you get bitten on the neck." He showed the boy the healed wound in his throat. "Chmee killed the vampire that...uh...attacked me."

"Why didn't the vampires get him?"

"Chmee's like nothing in the world. He's as likely to be seduced by a sausage plant."

"We make perfume from vampires," the boy said.

"What?" Something wrong with the translator?

The boy smiled too wisely. "One day you'll see. I've got to go. Will you be here later?"

Louis nodded.

"What's your name? Mine's Kawareksenjajok."

"Luuweuu."

The boy left by the stairwell. Louis stood frowning at the screen.

Perfume? The smell of vampires in Panth Building—and then Louis remembered the night Hairloprillalar came to his

bed, twenty-three years ago. She'd been trying to control him. She'd said so. Had she used vampire scent on him?

It couldn't matter now. "Calling the Hindmost," he said. "Calling the Hindmost."

Nothing.

The screen wasn't built to swivel. It faced always outward, away from the shadow squares. Annoying but informative: it could mean that the pictures were being beamed from the shadow squares themselves.

He reduced the scale on the screen. He sent the viewpoint swooping to spinward at impossible speed, until he was looking down on a world of water. He dropped like an angel in a death dive. This was fun. The Library's facilities were considerably better than *Needle*'s telescope.

The Earth Map was old. Half a million years had distorted the continents. Or more? A million? Two? A geologist would have known.

Louis shifted to starboard of antispinward until the Map of Kzin filled the screen: islands clustered around a plate of glare ice. And how old was this Map's topography? Chmee must know.

Louis expanded the view. He hummed as he worked. He skimmed above yellow-and-orange jungle. His view crossed a broad silver band of river, and he followed it toward the sea. At the junctures of rivers there ought to be cities.

He almost skimmed past it. A delta where two rivers joined; a pale grid-pattern imposed on jungle colors. Some human cities had "green belts"; but in this kzinti city they must cover more territory than the buildings. At maximum magnification Louis could just make out patterns of streets.

The kzinti had never liked big cities. Their sense of smell was too acute. This city was almost as big as the Patriarch's seat of government of Kzin.

They had cities. What else? If they had any kind of industry, they'd need... seaports? mining towns? Keep skimming.

Here the jungle was scrawny. The yellow-brown of barren soil showed through in a pattern that wasn't city-shaped at all. It looked like a melted archery target. At a guess, it was a very large and very old strip mine.

Half a million years ago, or more, a sampling of kzinti had been dropped here. Louis didn't expect to find mining towns. They'd be lucky to have anything left to mine. For half a million years they had been confined to one world, a world whose surface ended a few hundred feet down. But it seemed the kzinti had kept their civilization.

They had brains, these near-cats. They had ruled a respectable interstellar civilization. Tanj, it was kzinti who had taught humans to use gravity generators! And Chmee must have reached the Map of Kzin hours ago, in his search for allies against the Hindmost.

Louis had followed the river to the sea. Now he skimmed his god's-eye view "south" along the shoreline of the Map's largest continent. He expected ports, though the kzinti didn't use ships much. They didn't like the sea. Their seaports were industrial cities; nobody lived there for pleasure.

But that was in the Kzinti Empire, where gravity generators had been used for millennia. Louis found himself looking down on a seaport that would have rivaled New York Harbor. It crawled with the wakes of ships barely large enough to see. The harbor had the nearly circular look of a meteor crater.

Louis lowered the magnification, backing his viewpoint into the sky, to get an overview.

He blinked. Had his miserable sense of scale betrayed him again? Or had he mishandled the controls?

There was a ship moored across the harbor. It made the harbor look bathtub-sized.

The wakes of tinier ships were still there. It was real, then. He was looking at a ship as big as a town. It nearly closed off the arc of the natural harbor.

They wouldn't move it often, Louis thought. The motors would chew up the seabed something fierce. With the ship

gone the harbor's wave patterns would change. And how would the kzinti fuel something so big? How had they fueled it the first time? Where did they find the metals?

"Why?"

Louis had never seriously wondered if Chmee would find what he sought on the Map of Kzin. Not until now.

He spun the magnification dial. His viewpoint receded into space, until the Map of Kzin was a cluster of specks on a vast blue sea. Other Maps showed near the edges of the screen.

The nearest Map to the Map of Kzin was a round pink dot: Mars—and it was as far from Kzin as the Moon was from Earth.

How could such distances be conquered? Even a telescope wouldn't penetrate more than two hundred thousand miles of atmosphere. The idea of crossing that distance in a seagoing ship, even a ship the size of a small city—tanj!

"Calling the Hindmost. Louis Wu calling the Hindmost."

Time was running out for Louis Wu, as repairemen moved in on *Needle* and Chmee called the Map of Kzin for warriors. Louis didn't intend to mention any of this to the Hindmost. It would only upset the puppeteer.

What was the Hindmost *doing*, that he couldn't answer a call?

Could a human even guess at the answer?

Continue the survey, then.

Louis ran the scale down until he could see both rim walls. He looked for Fist-of-God Mountain near the Ringworld's median line, to port of the Great Ocean. Not there. He expanded the scale. A patch of desert bigger than the Earth was still small against the Ringworld. But there it was, reddish and barren, and the pale dot near the center was—Fist-of-God, a thousand miles tall, capped with naked *scrith*.

He skimmed to port, tracing the path they had taken following *Liar*'s crash. Long before he was ready, he had reached water, a wide-flung arm of the Great Ocean. They had stopped within sight of that bay. Louis drifted back, looking for what would be an oblong of permanent cloud, seen from above.

But the Eye Storm wasn't there.

"Calling the Hindmost! In the names of Kdapt and Finagle and Allah I summon thee, God tanj it! Calling—"

"I am here, Louis."

"Okay! I'm in a library in the floating city. They've got a Map Room. Look up Nessus's records of the Map Room we—"

"I remember," the puppeteer said coolly.

"Well, that Map Room showed old tapes. This one is running on present time!"

"Are you safe?"

"Safe? Oh, safe enough. I've been using superconductor cloth to make friends and influence people. But I'm trapped here. Even if I could bribe my way out of the city, I'd still have to get past the Machine People station on Sky Hill. I'd rather not shoot my way out."

"Wise."

"What's new at your end?"

"Two data. First, I have holograms of both of the other spaceports. All of the eleven ships have been rifled."

"The Bussard ramjets gone? All of them?"

"Yes, all."

"What else?"

"You cannot expect rescue from Chmee. The lander has set down on the Map of Kzin in the Great Ocean," the puppeteer reported. "I should have guessed. The kzinti has defected, taking the lander with him."

Louis cursed silently. He should have recognized that cool, emotionless tone. The puppeteer was badly upset; he was losing control of the finer nuances of human speech. "Where is he? What's he doing?"

"I watched through the lander's cameras as he circled the Map of Kzin. He found a capacious seagoing ship—"

"I found it, too."

"Your conclusions?"



expect that they will never develop space travel. Their ships would need to support an entire hive."

"Hospitable?"

"No, they would have fought the kzinti. And the kzinti have clearly given up the conquest of the Great Ocean. They seem to be using the great ship to block off a harbor."

"Yah. I'd guess it's a seat of government, too. You were telling me about Chmeee."

"After learning what he could by circling above the Map of Kzin, he hovered above the great ship. Aircraft rose and attacked him with explosive missiles. Chmeee allowed this, and the missiles did no harm. Then Chmeee destroyed four aircraft. The rest continued the attack until weapons and fuel were exhausted. When they returned to the ship, Chmeee followed them down. The lander presently rests on a landing platform on the great ship's conning tower. The attack continues. Louis, is he seeking allies against me?"

Louis hedged. "I'd say he doesn't know himself. He's collecting information the best way he knows how. If it's any comfort to you, he won't find anything that can go up against a General Products hull. They can't even hurt the lander."

Long pause; then, "Perhaps you're right. The aircraft use hydrogen-burning jets and missiles propelled by chemical explosives. In any case, I must rescue you myself. You must expect the probe at dusk."

"Then what? There's still the rim wall. You told me stepping disks won't send through *scrith*."

"I used the second probe to place a pair of stepping disks on the rim wall as a relay."

"If you say so. I'm in a building shaped like a top, at the port-by-spinward perimeter. Set the probe to hover until we decide what to do with it. I'm not sure I want to leave yet."

"You must."

"But all the answers we need could be right here in the Library!"

"Have you made any progress?"

"Bits and pieces. Everything Halloprillalar's people knew is somewhere in this building. I want to question the ghouls, too. They're scavengers, and they seem to be everywhere."

"You only learn to ask more questions. Very well, Louis. You have several hours. I will bring the lander to you at dusk."

GRAND THEFT

THE CAFETERIA WAS HALFWAY DOWN the building. Louis gave thanks for a bit of luck: The City Builders were omnivores. The meat-and-mushroom stew could have used salt, but it filled the vacuum in his belly.

Nobody used enough salt. And all the seas were fresh water, except for the Great Oceans. He might be the only hominid on the Ringworld who needed salt, and he couldn't live without it forever.

He ate quickly. Time pressed on the back of his neck. The puppeteer was already skittish. Surprising that he hadn't already fled, leaving Louis and the renegade Chmeee and the Ringworld to their similar fates. Louis could almost admire the puppeteer for waiting to rescue his press-ganged crewman.

But the puppeteer might change his mind when he saw the repair crew coming at him. Louis intended to be back aboard *Needle* before the Hindmost turned his telescope in that direction.

He went back to the upper rooms.

The reading screens he tried all gave unreadable script, and no pictures, and no voice. Finally, at one of a bank of screens, his eye caught a familiar collar.

"Harkabeeparolny?"

The librarian turned. Small flat nose, lips like a slash, bald scalp and a fine, delicate skull, long, wavy white hair—and a nice flare to her hips, and fine legs. She'd have been about forty, if she were human. City Builders might age slower than

"They tried to explore or colonize the other Maps."

"Yes. In known space the kzinti eventually conquered other stellar systems. On the Map of Kzin they must have looked across the ocean. They were not likely to develop space travel, of course."

"No." The first step in learning space travel is to put something in orbit. On Kzin, low orbital velocity was around six miles per second. On the Map of Kzin, the equivalent was seven hundred and seventy miles per second. "They couldn't have built too many of these ships, either. Where would they get the metals? And the voyages would take decades, at least. I wonder how they even knew there were other Maps."

"We may guess that they launched telescopic camera equipment aboard rockets. The instruments would have to perform quickly. A missile could not go into orbit. It would rise and fall back."

"I wonder if they reached the Map of Earth? It's another hundred thousand miles past Mars, and Mars wouldn't make a good staging area." What would kzinti have found on the Map of Earth? *Homo habilis* alone, or Pak protectors, too? "There's the Map of Down to starboard, and I don't know the world to antispinward."

"We know it. The natives are communal intelligences. We

human beings, or faster; Louis didn't know.

"Yes?"

There was a snap in her voice. Louis jumped. He said, "I need a voice-programmed screen and a tape to tell me the characteristics of *scrith*."

She frowned. "I don't know what you mean. Voice-programmed?"

"I want the tape to read to me out loud."

Harkabeeperolyn stared, then laughed. She tried to strangle the laugh, and couldn't; and it was too late anyway. They were the center of attention. "There is no such thing. There never has been," she tried to whisper, but the giggle bubbled up and made her voice louder than she wanted. "Why, can't you read?"

Blood and tanj! Louis felt the heat rising in his ears and neck. Literacy was admirable, of course, and everybody learned to read sooner or later, at least in Interworld. But it was no life-or-death matter. Every world had voice boxes! Why, without a voice box, his translator would have nothing to work with!

"I need more help than I thought. I need someone to read to me."

"You need more than you paid for. Have your master renegotiate."

Louis wasn't prepared to risk bribing this embarrassed and hostile woman. "Will you help me find the tapes I need?"

"You've paid for that. You've even bought the right to interrupt my own researches. Tell me just what you want," she said briskly. She tapped at keys, and pages of strange script jumped on her screen. "Characteristics of *scrith*? Here's a physics text. There are chapters on the structure and dynamics of the world, including one on *scrith*. It may be too advanced for you."

"That, and a basic physics text."

She looked dubious. "All right." She tapped more keys. "An old tape for engineering students on the construction of the rim transport system. Historical interest only, but it might tell you something."

"I want it. Did you people ever go *under* the world?"

Harkabeeperolyn drew herself up. "I'm sure we must have. We ruled the world and the stars, with machines that would make the Machine People worship us, if we had them now." She played with the keyboard again. "But we have no record of that event. What do you want with all this?"

"I don't quite know yet. Can you help me trace the origin of the old immortality drug?"

Harkabeeperolyn laughed, softly this time. "I don't think you can carry that many book spools. Those who made the drug never told their secret. Those who wrote books never found it. I can give you religious spools, police records, confidence games, records of expeditions to various parts of the world. Here's the tale of an immortal vampire who haunted the Grass Giants for a thousand *falans*, growing uncomfortably cunning with the years, until—"

"No."

"His hoard of the drug was never found. No? Let me see... Ktistek Building joined the Ten because the other buildings ran out of the drug before Ktistek did. A fascinating lesson in politics—"

"No, forget it. Do you know anything about the Great Ocean?"

"There are two Great Oceans," she informed him. "They're easy to pick out on the Arch at night. Some of the old stories say the immortality drug came from the antispinward Ocean."

"Uh-huh."

Harkabeeperolyn smirked. The small mouth could look prissy. "You are naive. One can pick out just two features on the Arch with the naked eye. If anything valuable came from far away and comes no more, somebody will say that it came from one of the Great Oceans. Who can deny it, or offer another origin?"

Louis sighed. "You're probably right."

"Luweewu, how can these questions possibly be connected?"

"Maybe they can't."

She got him the spools he'd requested, and another: a book for children, tales of the Great Ocean. "I can't think what you'll do with these. You won't steal them. You'll be searched when you leave, and you can't carry a reading machine with you."

"Thank you for your help."

He needed someone to read to him.

He didn't have the nerve to ask random strangers. Perhaps a nonrandom stranger? There had been a ghoul in one of these rooms. If ghouls in the shadow farm knew of Louis Wu, perhaps this one did, too.

But the ghoul was gone, leaving only her scent.

Louis dropped into a chair in front of a reading screen and closed his eyes. The useless spools bulged in two of his vest pockets. *I'm not licked yet*, he thought. *Maybe I can get Fortaralispolyar to read to me, or send someone. It'll cost more, of course. Everything always costs more. Takes longer.*

The reading machine was a big, clumsy thing, moored to the wall by a thick cable. The manufacturer certainly hadn't had superconducting wire. Louis threaded a spool into it and glared at the meaningless script. The screen's definition was poor... and there was no place for a speaker grid. Harkabeeperolyn had told the truth.

I don't have time for this.

Louis stood up. He had no choices left.

The roof of the Library was an extensive garden. Walks spiraled out from the center, from the top of the spiral stairs. Giant nectar-producing flowers grew in the rich black soil between the walks. There were small dark-green cornucopias with tiny blue flowers in the mouths, and a patch of weenie plant in which most of the "sausages" had split to give birth to golden blossoms, and trees that dropped festoons of greenish-yellow spaghetti.

The couples on the scattered benches gave Louis his privacy. He saw a good many blue-robed librarians, and a tall male librarian escorting a noisy group of Hanging People tourists. Nobody had the look of a guard. No ramps led away from the Library roof: there was nothing to guard, unless a thief could fly.

Louis intended a poor return for the hospitality he'd been given—purchased hospitality, but it bothered him.

The water condenser rose from the roof's edge like a sculptured triangular sail. It drained into a crescent-shaped pond. The pond seethed with City Builder children. Louis heard his name, "Luweewu!", and turned in time to catch an inflated ball against his chest.

The brown-haired boy he'd met in the Map Room clapped and shouted for the ball's return.

Louis dithered. Warn him to leave the roof? The roof would soon be a dangerous place. But the kid was bright. He might be bright enough to see the implications and call for guards.

Louis threw the wet ball back at him, and waved, and moved away.

If only he could think of a way to clear the roof entirely!

There were no guard rails at the edge of the roof. Louis walked with care. Presently he circled a clump of small trees whose trunks seemed to have been wrung like washcloths, and found himself in a place of reasonable privacy. There he used his translator.

"Hindmost?"

"Speaking, Chmeee is still under attack. He had retaliated once, by melting one of the great ship's large swivelling projectile launchers. I cannot guess at his motives."

"He's probably letting them see how good his defenses are. Then he'll deal."

"What will he deal for?"

"Even he doesn't know that yet. I doubt they can do much

THE RINGWORLD ENGINEERS

for him, except introduce him to a female or three. Hindmost, there's no way I can do any research here. I can't read the screens. I've got too much material anyway. It'd take me a week."

"What might Chmee accomplish in a week? I dare not stay to find out."

"Yah. What I've got is some reading spools. They'll tell us most of what we want to know, if we can read them. Can you do anything with them?"

"I think it unlikely. Can you furnish me with one of their reading machines? With that I could play the tapes on the screen and photograph them for *Needle's* computer."

"They're heavy. They've got thick cables that—"

"Cut the cables."

Louis sighed. "Okay. Then what?"

"Already I can see the floating city through the probe camera. I will guide the probe to you. You must remove the deuterium filter to expose the stepping disk. Have you a gripper?"

"I don't have any tools at all. What I've got is a flashlight-laser. You tell me where to slice."

"I hope this is worth losing half my fuel source. Very well. If you can secure a reading machine, and if it will pass through the opening to the stepping disk, well and good. Otherwise, bring the tapes. Perhaps there is something I can do."

Louis stood at the rim of the Library roof and looked down past his toes, into the textured dusk of the shadow farm. At the shadow's edge was noonday light. Rectangle-patterned farmland ran away from him; the Serpent River curled away to port, disappeared among low mountains; seas, flatlands, a tiny mountain range, tinier seas—all bluing with distance; and finally the Arch rising up and up. Half-hypnotized, Louis waited beneath the bright sky. There was nothing else to be done. He was barely aware of time passing.

The probe came out of the sky on a breath of blue flame. Where the nearly invisible fire touched the rooftop, the plants and soil became an orange inferno. Small Hanging People and blue-robed librarians and wet children ran screaming for the stairwell.

The probe settled into the flame and toppled on its side, slowed by attitude jets. There were tiny jets all around the upper rim, and the big jet underneath. It was twenty feet long and ten feet thick, a cylinder made lumpy by cameras and other instruments.

Louis waited until the fires had mostly gone out. Then he waded through coals to the probe. The roof was empty, as far as he could tell; empty even of bodies. No dead. Good.

The voice of his translator guided him as he cut away the thick molecular sieve in the top of the probe. Presently he had exposed a stepping disk. He asked, "Now what?"

"I've reversed the action of the stepping disk in the other probe and removed the filter. Can you get a reading machine?"

"I'll try. I don't like any of this."

"In two years it won't matter. I give you thirty minutes. Then come, bringing whatever you have."

A score of blue-robed librarians had almost decided to come after him when Louis appeared in the stairwell. His hood was pulled over his face. The bits of heavy metal they fired at him bounced from his impact armor, and he came on in a jerky step-stop-step walk.

The fusillade slowed and stopped. They retreated before him.

When they had gone far enough, Louis sliced through the top of the stair way below him. The spiral staircase had been moored only at top and bottom. Now it compressed like a spring, ripping side-ramps from doorsills. Librarians hung on for dear life. Louis had the top two floors to himself.

And when he turned to the nearest reading room, Harkabeeparolyn was blocking his path with an ax in her

hands.

"Once again I need you help," Louis said.

She swung. Louis caught the ax as it rebounded from the join of his neck and shoulder. She thrashed, trying to wrench it from his grip.

"Watch," he said. He waved the laser beam through the cable that fed a reading machine. The cable spurted flame and fell apart, sparking.

Harkabeeparolyn screamed, "Lyar Building will pay dearly for this!"

"That can't be helped. I want you to help me carry a reading machine up to the roof. I thought I was going to have to cut through a wall. This is better."

"I won't!"

Louis waved the light through a reading machine. It burned after failing apart. The smell was horrible. "Say when."

"Vampire lover!"

The machine was heavy, and Louis wasn't about to let go of the laser. He backed up the stairs; most of the weight was in Harkabeeparolyn's arms. He told her, "If we drop it we'll have to go back for another one."

"Idiot!... You've already... ruined the cable!"

He didn't answer.

"Why are you doing this?"

"I'm trying to save the world from brushing against its sun." She almost dropped it then. "But... but the motors! They're all back in place!"

"So you already knew that much! It's too little, too late. Most of your spaceships never came back. There aren't enough motors. Keep moving."

As they reached the roof, the probe lifted and settled beside them on attitude jets. They set the machine down. It wasn't going to fit. Louis gritted his teeth and sliced the screen free of the rest of the machine. Now it would fit.

Harkabeeparolyn just looked at him. She was too exhausted to comment.

The screen went into the gap where the molecular filter had been, and vanished. What remained, the guts of the machine, was much heavier. Louis managed to heave one end into the gap. He lay down on his back and used his legs to push it inward until it, too, vanished.

"Lyar Building had nothing to do with this," he told the librarian. "They didn't know what I had in mind. Here." He dropped a swatch of dull black cloth beside her. "Lyar Building can tell you how to fix water condensers and other old machines with this. You can make the whole city independent of the Machine People."

She watched him with eyes full of horror. It was hard to tell if she heard.

He eased himself feet first into the probe.

And out, head first, into *Needle's* cargo hold.

FINAL OFFER

HE WAS IN A GREAT ECHOING GLASS BOTTLE, in near-darkness. Twilight-shrouded, half-dismantled spacecraft showed through the transparent walls. The probe had been returned to clamps on the back wall of the cargo hold, eight feet off the gray-painted floor. And Louis nestled in the probe, in the gap where the deuterium filter had been, like an egg in an egg cup.

Louis swung out, hung by his hands and dropped. He was hit to the bone. One last complication, now, and then he could rest. Safety was just the other side of an impenetrable wall. He could see the sleeping plates...

"Good." The Hindmost's voice spoke from somewhere near the ceiling. "Is that the reading screen? I expected nothing so bulky. Did you have to chop it in half?"

"Yah." He had also dropped the components eight feet to the floor. Fortunately puppeteers were good with tools. "I hope you've got a set of stepping disks in here."

"I anticipated emergencies. Glance toward the forward left—*Louis!*"

A moan of unearthly terror rose behind him. Louis spun around.

Harkabeeparolyn was nestled in the probe, where Louis had been a moment ago. Her hands strangled the stock of a projectile weapon. Her lips were skinned back from her teeth. Her eyes could not find rest. They flicked up, down, left, right, and found no comfort anywhere.

The Hindmost spoke in a monotone. "Louis. Who is this that invades my spacecraft? Is it dangerous?"

"No, relax. It's just a confused librarian. Harkabeeparolyn, go back."

Her keening rose in pitch. Suddenly she wailed, "I know this place, I've seen it in the Map Room! It's the starship haven, outside the world! Luweewu, what are you?"

Louis pointed the flashlight-laser at her. "Go back."

"No! You've wrecked and stolen Library property. But if... if the world is threatened, I want to help!"

"Help how, you crazy woman? Look: you go back to the Library. Find out where the immortality drug came from, before the Fall of the Cities. That's the place we're looking for. If there's any way to move the world without the big motors, that's where we'll find the controls."

She shook her head. "I don't... How can you know that?"

"It's their home base. The pro—the Ringworld engineers had to have certain plants growing somewhere close... tanj... I'm guessing, I'm only guessing. Tanj dammit!" Louis held his head. It was throbbing like a big drum. "I didn't ask for any of this. I was kidnapped!"

Harkabeeparolyn swung herself out from the probe and dropped. Her coarse blue robe was damp with sweat. She looked a good deal like Hairloprillar. "I can help. I can read to you."

"We've got a machine for that."

She came closer. The weapon drooped as if forgotten. "We did it to ourselves, didn't we? My people took the world's steering motors for our starships. Can I help set that right?"

The Hindmost said, "Louis, the woman cannot return. The stepping disk in the first probe is still a transmitter. Is that a weapon in her hands?"

"Harkabeeparolyn, give me that."

She did. Louis held the projectile weapon awkwardly. It looked to be of Machine People make.

The Hindmost told him, "Carry it to the forward left corner of the cargo bay. The transmitter is there."

"I don't see it."

"I painted it over. Set the weapon in the corner and step back. Woman, hold your place!"

Louis obeyed. The gun disappeared. Louis almost missed a flick of motion beyond the hull as the weapon dropped onto the spaceport ledge. The Hindmost had set a stepping disk receiver on the outside of the hull.

Louis marveled. There were elements of Renaissance Italy in the puppeteer's paranoia.

"Good. Next—*Louis!* Another!"

A brown-fuzzed scalp poked out of the probe. It was the boy from the Map Room, stark naked and dripping wet and on the verge of toppling out as he stretched to look about him. His eyes were big with wonder. He was just the right age for confrontation with magic.

Louis bellowed, "Hindmost! Turn off those stepping disks now!"

"I have. I should have earlier. Who is this?"

"A librarian child. He's got a six-syllable name and I can't remember it—"

"Kawareskenajok," the boy shouted, smiling. "Where are we, Luweewu? What are we doing here?"

"Finagle only knows."

"Louis! I will not have these aliens on my ship!"

"If you're thinking of spacing them, forget it. I won't allow

it."

"Then they must stay in the cargo hold, and so will you. I think you planned this, you and Chmeee. I should never have trusted either of you."

"You never did."

"Repeat, please?"

"We'll starve in here."

There was a longish pause. Kawareskenajok dropped lithely from the probe. He and Harkabeeparolyn engaged in furious whispering.

"You may return to your cell," the Hindmost said suddenly.

"They may stay here. I will leave a stepping disk link open so that you may feed them. This may work out very well."

"How?"

"Louis, it is good that some Ringworld natives survive."

The Ringworlders weren't close enough to hear Louis's translator. He said, "You're not thinking of giving up now, are you? What's in these tapes could take us straight to the magic transmutation device."

"Yes, Louis. And the wealth from the maps of several worlds may be in Chmeee's hands right now. We may count on distance to protect us for two or three days, no more. We must go soon."

The natives looked around at Louis's approach. He said, "Harkabeeparolyn, help me carry the reading machine."

Ten minutes later the spools and the reading machine and the severed screen were with the Hindmost on the flight deck. Harkabeeparolyn and Kawareskenajok awaited further orders.

"You'll have to stay here for a bit," Louis told them. "I don't know just what's going to happen. I'll send you food and bedding. Trust me." He could feel the guilt in his face and he turned quickly and stepped into the corner.

A moment later he was back in his cell—pressure suit, vest, flying belt, and all.

Louis stripped himself and dialled for a set of informal pajamas. Already he felt better. He was tired, but Harkabeeparolyn and Kawareskenajok had to be provided for. The kitchen would not give him blankets. He dialled for four voluminous hooded ponchos and sent them through the stepping disks.

He reached back into his memory. What did Hairloprillar like to eat? She was an omnivore, but she preferred fresh foods. He chose provisions for them. Through the wall he watched their dubious expressions as they examined it.

He dialled for walnuts and a pedigree Burgundy for himself. Munching and sipping, he activated the sleeping field and tumbled into it and stretched out in free fall to think.

Lyar Building would pay for his banditry. Had Harkabeeparolyn left the superconductor cloth behind in the Library, to help pay for the damage? He didn't even know that.

What was Valavirgillin doing now? Frightened for her whole species, for her whole world, and with no way to do anything about it, courtesy of Louis Wu. The woman and boy in the cargo hold must be just as frightened—and if Louis Wu died in the next few hours, they would not survive him long.

It was all part of the price. His own life was on the line, too.

Step one: Get the flashlight-laser aboard *Needle*. Done.

Step two: Could the Ringworld be moved back into position? In the next few hours he *might* prove that it was *not* possible. It would depend on the magnetic properties of *scrith*.

If the Ringworld could not be saved, then—flee.

If the Ringworld *could* be saved, then—

Step three: Make a decision. Was it possible for Chmeee and Louis Wu to return alive to known space? If not, then—

Step four: Mutiny.

He should have left that patch of superconductor cloth in Lyar Building itself. He should have reminded the Hindmost to disconnect the probe's stepping disks. The fact was that Louis Wu had been making some poor decisions lately. It bothered

him. His next moves were going to be savagely important.

But for the moment, he could steal a few hours' sleep—to match his other thefts.

Voices, dimly heard. Louis stirred, and turned in free fall, and looked about him.

Beyond the aft wall, Harkabeeparolyn and Kawareskenajok were in animated conversation with the ceiling. To Louis it was gibberish. He didn't have his translator. But the City Builders were pointing to a rectangular hologram floating outside the hull, blocking part of the spaceport ledge.

Through that "window" Louis could see the sunlit courtyard of a gray stone castle. Rough-hewn stone in big masses; lots of right angles. The only windows were vertical arrow slits. Some kind of ivy was crawling up one of the walls. Luxurious, pale yellow ivy with scarlet veins.

Louis pushed himself out of the field.

The puppeteer was at his bench on the flight deck. Today his mane was a cloudy phosphorescent glow. He turned one head at Louis's approach. "Louis, I trust you are rested?"

"Yah, and I needed it, too. Any progress?"

"I was able to repair the reading machine. *Needle's* computer doesn't know enough of the City Builder tongue to read tapes about physics. I hope to pick up a vocabulary by talking to the natives."

"How much longer? I've got some questions about the Ringworld's general design." Could the Ringworld floor, the whole six hundred million million square miles of it, be used to manipulate the Ringworld's position electromagnetically? If he could know for sure!

"Ten to twenty hours, I think. We all need to rest occasionally."

Too long, Louis thought, with the repair crew coming down their throats. Too bad. "Where's the picture coming from? The lander?"

"Yes."

"Can we get a message to Chmeee?"

"No."

"Why not? He must be carrying his translator."

"I made the mistake of turning the translator function off by way of coercion. He isn't carrying it."

"What happened?" Louis asked. "What's he doing in a medieval castle?"

The Hindmost said, "It has been twenty hours since Chmeee reached the Map of Kzin. I've told you how he made his reconnaissance flight, how he allowed kzinti aircraft to attack him, how he landed on the great ship and waited while they continued their attacks. The attacks lasted some six hours before Chmeee himself broke off and flew elsewhere. I wish I understood what he hoped to gain, Louis."

"I don't know either, really. Go on."

"The aircraft followed him some way, then turned back. Chmeee continued to search. He found a stretch of wilderness with a small, walled stone castle on the highest peak. He landed in the courtyard. He was attacked, of course, but the defenders had nothing but swords and bows and the like. When they were well assembled around the lander, he sprayed them with stun cannon. Then he—"

"Hold it."

A kzinti sprang out of one of the rounded arches and across the gray flagstones, moving toward the hologram window at a four-legged dead run. It had to be Chmeee; he was wearing impact armor. An arrow protruded from his eye, a long wooden arrow with papery leaves for feathering.

Other kzinti ran behind him, waving swords and maces. Arrows fell from the slit windows and glanced from his impact armor. As Chmeee reached the lander's airlock, a thread of light lashed from a window. The laser beam chewed flame from the flagstones, then focused on the lander. Chmeee had disappeared. The beam held...then snuffed out, as the slit window exploded in red and white flame.

Larry Niven

"Careless," the Hindmost murmured. "Giving such a weapon to enemies!" His other mouth nibbled at the controls. He switched to an inside camera. Louis watched Chmeee lock the airlock, then stagger toward the autocod, struggling to remove his impact armor, dropping it as he came. The kzinti's leg was gashed beneath the armor. He heaved the lid of the autocod up and more or less fell inside.

"Tanji! He hasn't turned the monitors on! Hindmost, we've got to help him..."

"How, Louis? If you tried to reach him via stepping disks, you would be heated to fusion temperatures. Between your velocity and the lander's—"

"Yah." The Great Ocean was thirty-five degrees around the curve of the Ringworld. The kinetic energy difference would be enough to blast a city. There was no way to help.

Chmeee lay bleeding.

Suddenly he cried out. He half turned over. His thick fingers stabbed at the autocod's keyboard. He heaved himself on his back, reached up and pulled the cover closed.

"Good enough," Louis said. The arrow had entered the socket at a sharp outward angle. It may have missed destroying brain tissue...or not. "He was careless, all right. Okay, go on."

"Chmeee used stun cannon to irradiate the entire castle. Then he spent three hours loading unconscious kzinti onto repulor platforms and taking them outside. He barred the gates. He went away, into the castle. For nine hours I saw nothing of him. Why are you grinning?"

"He didn't take any females outside, did he?"

"No. I think I see."

"He was tanji lucky to get his armor on fast enough. He got that slash on his leg before he finished."

"It does seem that Chmeee is no threat to me."

He'd be in the 'dot twenty to forty hours, Louis estimated. Now it was Louis Wu's decision alone. "There's something we ought to discuss with him, but I guess there's no help for it. Hindmost, please record the following conversation. Send it to the lander on a looped tape. I want it in Chmeee's ears when he wakes up."

The puppeteer reached behind him; he seemed to chew at the control panel. "Done. What is it we are to discuss?"

"Chmeee and I haven't been able to make ourselves believe that you'll take us back to known space. Or even that you can."

The puppeteer peered at him from two directions. His flat heads spread wide, giving him maximum binocular effect, the better to study his dubious ally and possible enemy. He asked, "Why should I not, Louis?"

"First, we know too much. Second, you don't have any reason to go back to any world in known space. With or without the magic transmutor, the place you want to be is the Fleet of Worlds."

Muscles in the puppeteer's hindquarters flexed restlessly. (That was the leg a puppeteer fought with: turn your back on the enemy, zero in with wide-spaced eyes—kick!) He said, "Would that be so bad?"

"It might be better than staying here," Louis conceded.

"What did you have in mind?"

"We can make your lives very comfortable. You know that we have the kzinti longevity drug. We can supply boosterspice, too. There is room in *Needle* for hominid and kzinti females, and in fact we have a City Builder female aboard. You would travel in stasis, so crowding is not a problem. You and your entourage may settle on one of the four farming worlds of the Fleet. You would virtually own it."

"What if we got bored with the pastoral life?"

"Nonsense. You would have access to the libraries of the home world. Access to knowledge humanity has wondered about since first we revealed ourselves! The Fleet is moving through space at nearly lightspeed, eventually to reach the Cloud of Magellan. With us you will escape the galactic core explosion. Likely we will need you to explore...interesting

GALILEO 63

territories ahead of our path."

"You mean dangerous."

"What else would I mean?"

Louis was more tempted than he would have expected. How would Chmee take such an offer? Vengeance postponed? A chance to damage the puppeteer homeworld in some indefinite future? Or simple cowardice?

He asked, "Is this offer contingent on our finding a magic transmutor?"

"No. Your talents are needed regardless. However...any promise I make now would be more easily carried out under an Experimentalist regime. Conservatives might not recognize your value, let alone Chmee's."

That was nicely phrased, Louis conceded. "Speaking of Chmee..."

"The kzin has defected, but I leave my offer open to him. He has found kzin females to save. Perhaps you can persuade him."

"I wonder..."

"And after all, you may see your worlds again. In a thousand years, known space may have forgotten the puppeteers. Mere decades will have passed for you, falling near lightspeed with the Fleet of Worlds."

"I want time to think it over. I'll put it to Chmee when I get the chance." Louis glanced behind him. The City Builders were watching him. It was a pity he couldn't consult them; because he was deciding their fate, too.

But he had decided. "What I'd like to do next," he said, "is move on to the Great Ocean. We could come up through Fist-of-God Mountain and go slowly enough..."

"I have no intention of moving *Needle* at all. There may be other threats than the meteor defense, and surely it is enough!"

"I'll bet I can change your mind. Do you remember finding a rig for hoisting the Bussard ramjets on the rim wall? Have a look at that rig now."

For a moment the puppeteer remained frozen. Then he whirled and was out of sight behind the opaque wall of his quarters.

And that ought to keep him busy long enough.

At his leisure, Louis Wu moved to his pile of discarded clothing and equipment. He fished the flashlight-laser out of his vest. *Step four*—coming up. A pity his autodoc was in the lander, a hundred million miles out of reach. He might need it soon.

There was certainly flare shielding on the outer hull of *Needle*. Every ship had that, at least on the windows. Under the impact of too much light, flare shielding became a mirror, and maybe saved the pilot's eyesight.

It stopped solar flares, and it stopped lasers. If the Hindmost had set impervious walls between himself and his captive crew, surely he would have coated the entire flight deck with shielding.

But what about the floor?

Louis knelt. The hyperdrive motor ran the whole length of the ship, bronze-colored, with some copper and hullmetal. Puppeteer machinery, with all angles rounded, it looked half-melted already. Louis angled the flashlight-laser into it and fired through the transparent floor.

Light glared back from the bronze surface. Metal vapor spewed. Liquid metal ran. Louis let the beam chew deep, then played it around, burning or melting anything that looked interesting. A pity he'd never studied hyperdrive system engineering.

The laser grew warm in his hand. He'd been at this for some minutes. He shifted the beam to one of the six mountings that held the motor suspended in its vacuum chamber. It didn't melt; it softened and settled. He attacked another. The motor's great mass sagged and twisted.

The narrow beam flickered, strobelike, then faded. Battery

dead. Louis tossed the flashlight-laser away from him, remembering that the puppeteer could make it explode in his hand.

He stroked to the forward wall of his cage. The puppeteer wasn't in sight; but presently Louis heard the sound of a steam calliope dying in agony.

The puppeteer trotted around the opaque green section and stood facing him. Muscles quivered beneath his skin.

"Come," said Louis Wu, "let us reason together."

Without haste, the puppeteer tucked both heads beneath his forelegs and let his legs fold under him.

COUNTERPROPOSAL



LOUIS WU WOKE CLEAR-HEADED AND HUNGRY.

For a few minutes he rested, savoring free fall; then he reached out and killed the field. His watch said he'd slept seven hours.

Needle's guests were sleeping beneath one of the tremendous clamps that had held the lander in place during flight. The white-haired woman slept restlessly, tangled in her ponchos, with one bare leg sticking out. The brown-haired boy slept like a baby.

There was no way to wake them, and no point. The wall wouldn't carry sound, and the translator didn't work. And the stepping disk link would carry no more than a few pounds. Had the puppeteer really expected some kind of conspiracy? Louis smiled. His mutiny had been simplicity itself.

He dialled a toasted cheese handmeal and ate while he paddled to the forward wall of his cell.

In repose the Hindmost was a smooth egg shape, covered in hide, with a cloud of white hair tufting the big end. His legs and his heads were hidden beneath him. He hadn't moved in seven hours.

Louis had seen Nessus do that. It was a puppeteer's response to shock: to tuck himself into his navel and make the universe disappear. Well and good, but nine hours seemed excessive. If the puppeteer had been driven into catatonia by Louis's shock treatment, that could be the end of everything.

The puppeteer's ears were in his heads. Louis's words must carry through a thickness of meat and bone. He shouted, "Let me offer you several points to ponder."

The puppeteer did not respond. Louis raised his voice in soliloquy. "This structure is sliding into its sun. There are things we can do about that, but we can't do any of them while you contemplate your navel. Nobody but you can control any of *Needle*'s instruments, sensors, drives, *et cetera*, and that's just the way you planned it. So. Every minute you spend imitating a footstool, you and I and Chmee come one minute closer to an opportunity no astrophysicist could resist."

He finished his handmeal while he waited. Puppeteers were superb linguists, in any number of alien languages. Would a puppeteer respond to a narrative hook?

And in fact the Hindmost exposed one head far enough to ask, "What opportunity?"

"The chance to study sunspots from underneath."

The head withdrew under the puppeteer's belly.

Louis bellowed, "The repair team is coming!"

Head and neck reappeared and bellowed in response. "What have you done to us? What have you done to me, to yourself, to two natives who might have fled the fire? Did you have thought for anything besides mere vandalism?"

"I did. You said it once. Some day we must decide who rules this expedition. This is the day," said Louis Wu. "Let me tell you why you should be taking my orders."

"I never guessed that a wirehead would lust for mere power."

"Make that point one. I'm better at guessing than you are."

"Proceed."

"We're not leaving here. Even the Fleet of Worlds is out of reach at slower-than-light speeds. If the Ringworld goes, we all

THE RINGWORLD ENGINEERS



C.S.

Courtesy Skinner

go. We've got to put it back in position somehow.

"Third point. The Ringworld Engineers have been dead for at least a quarter of a million years," Louis said carefully. "Chmee would say a couple of million. The hominids couldn't have mutated and evolved while the Ringworld Engineers were alive. They wouldn't have allowed it. They were Pak protectors."

Louis had expected horror, or terror, or surprise. The puppeteer showed only resignation. "Xenophobes," he said. "Vicious and hardy and very intelligent."

He must have suspected.

"My ancestors," said Louis. "They built the Ringworld, and they built whatever system is supposed to hold it in place. Which of us has a better chance of thinking like a Pak protector? One of us has to try."

"These arguments would mean nothing if you had left us the chance to run. Louis, I trusted you."

"I wouldn't like to think you were that stupid. We didn't volunteer for this expedition. Kzinti and humans, we make poor slaves."

"Did you have a fourth argument?"

Louis grimaced. "Chmee is disappointed in me. He wants

to force you to his will. If I can tell him you're taking my orders, he'll be impressed. And we need him."

"We do, yes. He may think more like a Pak protector than you do."

"Well?"

"Your orders?"

Louis told him.

Harkabeeparolyn had rolled over and was on her feet before she saw Louis stepping out of the corner. Then she gasped, crouched, and disappeared into the ponchos. A lumpy poncho slithered toward a discarded blue robe.

Peculiar behavior. City Builders with a nudity taboo? Should Louis have worn clothing? He did what he considered tactful: he turned his back on her and joined the boy.

The boy was at the wall, looking out at the great dismembered starships. The poncho he wore was too big for him. "Luweewu," he asked, "were those our ships?"

"Yah."

The boy smiled. "Did your people build ships that big?"

Louis tried to remember. "The slowboats were almost that size. We needed very big ships before we broke the lightspeed barrier."

"Is this one of your ships? Can it travel faster than light?"

"It could once. Not any more. I think the #4 General Products hulls were even bigger than yours, but we didn't build those. They were puppeteer ships."

"That was a puppeteer we were talking to yesterday, wasn't it? He asked about you. We couldn't tell him much."

Louis smiled. "Good."

Harkabeeparolyn had come to join them. She had recovered her composure with her blue librarian's robe. She asked, "Has our status changed, Luweewu? We were told that you would not be allowed to visit us." It was effort for her to look him in the face.

"I've taken command," Louis said.

"So easily?"

"I paid a price—"

The boy's voice cut in. "Luweewu? We're moving!"

"It's all right."

"Can you make it darker in here?"

Louis shouted the lights out. Immediately he felt more comfortable. The dark hid his nakedness. Harkabeeparolyn's attitude was contagious.

Hot Need of Inquiry lifted twelve feet above the spaceport ledge. Quietly, almost furtively, with no display of pyrotechnics, the ship drifted to the edge of the world and off.

"Where are we going?" the woman demanded.

"Under the world. We'll end up at the Great Ocean."

There was no sensation of falling, but the spaceport ledge was falling silently upward. The Hindmost let them drop several miles before he activated the thrusters. *Needle* decelerated and began edging beneath the Ringworld.

The edge of blackness slid across to become the sky. Below was a sea of stars, brighter than anything a ringworld native could have seen through depths of air and scattered Archlight. But the sky was essence of black. The Ringworld's sheath of foamed *scrith* reflected no starlight.

Louis still felt uncomfortable in his nudity. "I'm going back to my room," he said. "Why don't you join me? There's food and a change of clothing, and better beds if you want them."

Harkabeeparolyn flicked into existence, last in line on the stepping disk, and flinched violently. Louis laughed aloud. She tried to glare at him, but her eyes shied away. *Naked!*

Louis dialled for a falling jumper and covered himself.

"Better?"

"Yes, better. Do you think I am foolish?"

"No, I think you don't have climate control. You can't go naked, most places, so it looks strange to you. I could be wrong."

"You could be right," she said, surprised.

"You slept on a hard deck last night. Try the water bed. It's big enough for both of you and a couple more, and Chmeech isn't using it right now."

Kawareskenajok flung himself bodily onto the fur-covered water bed. He bounced, and waves surged outward beneath the fur. "Luweewu, I like it! It's like swimming, but dry!"

Stiff-backed with distrust, Harkabeeparolyn sat down on the uneasy surface. Dubiously she asked, "Chmeee?"

"Eight feet tall and covered with orange fur. He's...on a mission in the Great Ocean. We're going to get him now. You may talk him into sharing with you—"

The boy laughed. The woman said, "Your friend must find another playmate. I do not indulge in *rishathra*."

Louis chorled. (The underside of his mind thought: *tanj!*) "Chmeech's stranger than you think. He's as likely to want *rishathra* with a weenie plant. You'd be quite safe, unless he wants the whole bed, which is possible. Be careful never to shake him awake. Or you can try the sleeping plates."

"Do you use the sleeping plates?"

"Yes." He guessed at the meaning of her expression. "The field can be set to keep two bodies apart." (*Tanj!* did the boy's presence inhibit her?)

She said, "Luweewu, we have inflicted ourselves on you in the middle of your mission. Did you come simply to steal knowledge?"

The correct answer would have been yes. Louis's answer was at least true. "We're here to save the Ringworld."

Thoughtfully she said, "But how can I—?" And then she was staring past Louis's shoulder.

The Hindmost waited beyond the forward wall—and he was glorious. Now his claws were tipped with silver, and he wore his mane in gold and silver strands. The short pale hair over the rest of his body had been brushed to a glow. "Harkabeeparolyn, Kawareskenajok, be welcome," he sang. "Your aid is urgently needed. We have traveled a vast distance between the stars in hope of saving your peoples and your world from a fiery death."

Louis swallowed laughter. Fortunately his guests had eyes only for the Pierson's puppeteer.

"Where are you from?" the boy demanded of the puppeteer. "What is it like?"

The puppeteer tried to tell them. He spoke of worlds falling through space at near lightspeed, five worlds arrayed in a pentagon, a Kemplerian rosette. Artificial suns circled four, to grow food for the population of the fifth. The fifth world glowed only by the light of its streets and buildings. Continents blazed yellow-white, oceans dark. Isolated brilliant stars surrounded by mist were factories floating on the sea, their waste heat boiling the water. Waste industrial heat alone kept the world from freezing.

The boy forgot to breathe as he listened. But the librarian spoke softly to herself. "He *must* come from the stars, He is shaped like no living thing known anywhere."

The puppeteer spoke of crowded streets, tremendous buildings, parks that were the last refuge of a world's native life. He spoke of stepping-disk arrays whereby one could walk around the world in minutes.

Harkabeeparolyn shook her head violently. Her voice rose. "Please, we don't have time. I'm sorry, Kawa! We want to hear more, we *need* to know more, but—the world, the sun! Louis, I never should have doubted you. What can we do to help?"

The Hindmost said, "Read to me."

Kawareskenajok lay on his back, watching the back of the world roll past him.

Needle ran beneath a featureless black roof in which the Hindmost had set two hologram "windows." One wide rectangle showed a light-amplified view; the other examined the Ringworld's underside by infrared light. In infrared the

underside of day still glowed brighter than night-shadowed land; and rivers and seas were dark by day and light by night.

"Like the back of a mask, see?" Louis kept his voice down to avoid interrupting Harkabeeparolyn. "That branching river chain: see how it stands out? The seas bulge, too. And that line of dents, that's a whole mountain range."

"Are your worlds like that?"

"Oh, no. On one of my worlds all that would be solid underneath, and the surface would be happening by accident. Here the world was scupted. Look the seas are all the same depth, and they're spaced out so there's enough water everywhere."

"Somebody carved the world like a fresco?"

"Just like that."

"Luweewu, that's scary. What were they like?"

"They thought big, and they loved their children, and they looked like suits of armor." Louis decided not to say more about the protectors.

The boy pointed, "what's that?"

"I don't know." It was a dimple in the Ringworld's underside—with fog in it. "I think it's a meteor puncture. There'll be an Eye Storm above it."

The reading screen was on the flight deck, facing Harkabeeparolyn through the wall. The Hindmost had repaired the damage and added a braided cable that led into the control panel. As Harkabeeparolyn read aloud, the ship's computer was reading the tape and correlating it to her voice and to its own stored knowledge of Haliorpillaar's tongue. That tongue would have changed over the centuries, but not too much, not in a literate society. Hopefully the computer could take over soon.

As for the Hindmost, he had disappeared into the hidden section. The alien had suffered repeated shocks. Louis didn't begrudge him time off for hysterics.

Needle continued to accelerate. Presently the inverse landscape was speeding past almost too fast for detail. And Harkabeeparolyn's voice was becoming throaty. Time for a lunch break, Louis decided.

A problem emerged. Louis dialled filets mignon and baked potatoes, with Brie and french bread to follow. The boy stared in horror. So did the woman—but at Louis Wu.

"I'm sorry, I forgot. I keep thinking of you as omnivores."

"Omnivores, yes. We eat plants and flesh both," the librarian said. "But not *decayed* food!"

"Don't get so upset. There's no bacteria involved." Properly aged steak, milk attacked by mold—Louis dumped their plates into the toilet and dialled again. Fruit, *crudities* with a separate sour cream dip which he dumped, and seafood including *sashimi*. His guests had never seen salt water fish before. They liked it, but it made them thirsty.

And watching Louis eat made them unhappy. What was he supposed to do, starve?

They might starve. Where would he get fresh red meat for them? Why, from Chmeech's side of the autokitchen, of course. Broil it with the laser on wide beam, high intensity. He'd have to get the Hindmost to recharge the laser. That might not be easy, considering the last use to which he'd put it.

Another problem: they might be consuming too much salt. Louis didn't know what to do about that. Maybe the Hindmost could reset the autokitchen controls.

After lunch Harkabeeparolyn went back to her reading. By now the Ringworld was streaming past too fast for detail. Kawareskenajok flicked restlessly from cell to cargo hold and back again.

Louis, too, was restive. He should be studying: reviewing the records of the first voyage, or of Chmeech's adventures to date on the Map of Kzin. But the Hindmost wasn't available.

Gradually he became aware of another source of discomfort.

He lusted after the librarian.

He loved her voice. She'd been talking for hours, yet the lilt was still there. She'd told him that she sometimes read to blind

children: children without sight. Louis got queasy just thinking about it. He liked her dignity, and her courage. He liked the way the robe outlined her shape; and he'd glimpsed her nakedness.

It had been years since Louis Wu loved a strictly human woman. Harkabeparolyn came too close. And she wasn't having any. When the puppeteer finally rejoined them, Louis was glad of the distraction.

They talked quietly in Interworld, below the sound of Harkabeparolyn reading to the computer.

"Where did they come from, these amateur repairmen?" Louis wondered. "Who on the Ringworld would know enough to re-mount the attitude jets? Yet they don't seem to know that it's not enough."

"Let them alone," the Hindmost said.

"Maybe they know it's not enough? Maybe the poor bleeders just can't think of anything else to do. And there's the question of where they got their equipment. It could have come from the Repair Center."

"We face enough complication now. Let them alone."

"For once I think you're right. But I can't help wondering. Teela Brown got her schooling in human space. Big space-built structures are nothing new to her. She'd know what it meant when the sun started sliding around."

"Could Teela Brown have organized so large an effort?"

"Maybe not. But Seeker would be with her. Was Seeker in your tapes? He was a Ringworld native, and maybe immortal. Teela found him. A little crazy, but he could have done the organizing. He was a king more than once, he said."

"Teela Brown was a failed experiment. We tried to breed a lucky human being, feeling that puppeteer associates would share their luck. Teela may or may not have been lucky, but her luck was surely not contagious. We do not want to meet Teela Brown."

Louis shivered. "No."

"Then we must avoid the attention of the repair crew."

"Add a postscript to the tape you're sending to Chmee," Louis said. "Louis Wu rejects your offer of sanctuary on the Fleet of Worlds. Louis Wu has taken command of *Hot Needle of Inquiry* and has destroyed the hyperdrive motor. That should shake him up."

"It did that for me. Louis, my sensors will not penetrate *scrith*. Your message will have to wait."

"How long until we reach him?"

"About forty hours. I have accelerated to a thousand miles per second. At this velocity it takes more than five gravities of acceleration to hold us in our path."

"We can take thirty gravities. You're being overcautious."

"I'm aware of your opinion."

"You don't take orders worth a tanj," Louis said. "Either."

THE SEEDS OF EMPIRE

BEYOND THE CURVED CEILING, the Ringworld floor screamed past.

It wasn't much of a view, not from thirty thousand miles away, passing at a thousand miles per second, and cloaked in foam padding. Presently the boy fell asleep in the orange furs. Louis continued to watch. The alternative was to float here wondering if he'd doomed them all.

Finally the Hindmost told the City Builder woman, "Enough."

Louis tumbled off the shifting surface.

Harkabeparolyn massaged her throat. They watched as the Hindmost ran four stolen tapes through the reading machine.

It took only a few minutes. "This now becomes the computer's problem," the puppeteer said. "I've programmed in the question. If the answers are on tapes, we'll have them in a few hours maximum. Louis, what if we don't like the answers?"

"Let's hear the question."

Larry Niven

"Is there a history of repair activity on the Ringworld? If so, did repair machinery approach from any one source? Is repair more frequent in any given locale? Is any section of the Ringworld in better repair than the rest? Locate all references to Pak-like beings. Does the style of armor vary with distance from a central point? What are the magnetic properties of the Ringworld floor and of *scrith* in general?"

"Good."

"Did I miss anything?"

"Yah. We want the most probable source of the immortality drug. It'll be the Great Ocean, but let's ask anyway."

"I will. Why the Great Ocean?"

"Oh, partly because it's so visible. And partly because we've found one surviving sample of the immortality drug, and one only. Hairloprillalar had it. We found her in the vicinity of the Great Ocean." *And partly because we crashed there*, Louis thought. *The luck of Teela Brown distorts probability. Teela's luck could have brought us straight to the Repair Center, that first time.* "Harkabeparolyn? Can you think of anything we missed?"

Her voice was scratchy. "I don't understand what you're doing."

How to explain? "Our machine remembers everything on your tapes. We tell it to search its memory for answers to given questions."

"Ask it how to save the Ringworld."

"We have to be more specific. The machine can remember and correlate and do sums, but it can't think for itself. It's not big enough."

She shook her head.

"What if the answers are wrong?" the Hindmost persisted. "We cannot flee."

"We try something else."

"I have thought about this. We must go into polar orbit around the sun, to minimize the risk that a fragment of the disintegrating Ringworld will strike us. I will put *Needle* in stasis, to wait for rescue. Resuce will not come, but the risk is better than what we face now."

It could come to that, Louis thought. "Fine. We've got a couple of years to try to find better odds."

"Less than that. If—"

"Shut up."

The exhausted librarian dropped onto the water bed. Imitation kzin fur surged and rippled under her. She held herself rigid for a moment, then cautiously let herself fall back. The fur continued to ripple. Presently the stiffness left her and she let herself roll with the tide. Kawareskenjajok murmured sleepy protest and turned over.

The librarian looked most appealing. Louis resisted an urge to join her on the bed. "How are you feeling?"

"Tired. Miserable. Will I ever see my home again? If the end comes... when it comes... I'd like to wait for it on the Library roof. But the flowers will be dead by then, won't they? Scorched and frozen."

"Yah." Louis was touched. Certainly he'd never see his own home again. "I'll try to get you back. Right now you need sleep. And a back massage."

"No."

Strange. Wasn't Harkabeparolyn one of the City Builders, Hairloprillalar's people, who had ruled the Ringworld largely through sex appeal? It was difficult to remember, sometimes, that the individuals within an alien species could differ as thoroughly as humans did.

He said, "The Library staff seemed more priests than professionals. Do you practice continence?"

"While we work in the Library, we are continent. But I was continent by choice." She rose on an elbow to look at him. "We learn that all other species lust to do *rishathra* with the City Builders. Is that the case with you?"

He admitted it.

"I hope you can control it."

He sighed. "Oh, tanj, yes. I'm a thousand *fatans* old. I've learned how to distract myself."

"How?"

"Ordinarily I'd go looking for another woman."

The librarian didn't laugh. "What if another woman is not available?"

"Oh...exercise to exhaustion. Get drunk on 'fuel.' Go on sabbatical, off into interstellar space in a one-man ship. Find some other pleasure to indulge myself. Get involved in work."

"You should not be drunk," she said, and she was right.

"What pleasure might you try?"

The droid! A touch of current and he wouldn't care if Harkabeeparolyn turned to green slime before his eyes. Why should he care now? He didn't admire her...well, maybe he did, a little. But she'd done her part. He could save the Ringworld, or lose it, without more help from her.

"You'll have your massage anyway," he said. He stepped wide around her to touch a control on the water bed. Harkabeeparolyn looked startled, then smiled and relaxed completely, as the sonic vibrations in the water enfolded her. In a few minutes she was asleep. He set the unit to switch off in twenty minutes.

Then he brooded.

If he hadn't spent a year with Halirlopprillalar, he'd find Harkabeeparolyn unsightly, with her bald head and knife-edge lips and small flat nose. But he had.

He had hair where no City Builder had hair. Was that it? Or the smell of his food on his breath? Or a social signal he didn't know?

A man who had hijacked a starship, a man who had bet his life on the chance to rescue trillions of other lives, a man who had beaten the ultimate in drug habits, should not be bothered by so minor a distraction as an itch for a lovely roommate. A touch of the wire would give him the dispassionate clarity to see that.

Yah.

Louis went to the forward wall. "Hindmost!"

The puppeteer trotted into view.

"Run the records of the Pak for me. Interviews and medical reports on Jack Brennan, studies of the alien's corpse—everything you've got." He'd try work.

Louis Wu hovered in midair, in lotus position, with his loose clothing drifting around him. On a screen that floated motionless outside *Needle*'s hull, a man long dead was lecturing on the origin of humanity.

"Protectors have precious little free will," he was saying. "We're too intelligent not to see the right answers. Besides that, there are instincts. If a Pak protector has no living children, he generally dies. He stops eating. Some protectors can generalize; they can find a way to do something for their whole species, and it keeps them alive. I think that was easier for me than it was for Phssthpok."

"What did you find? What's the cause that keeps you eating?"

"Warning you about Pak protectors."

Louis nodded, remembering the autopsy data on the alien. Phssthpok's brain was bigger than a man's; but the swelling did not include the frontal lobes. Jack Brennan's head looked dented in the middle because of his human frontal development and the upward swelling of the back of the skull.

Brennan's skin was deeply wrinkled leathery armor. His joints were abnormally swollen. His lips and gums had fused into a hard beak. None of this seemed to bother the drastically altered Belt miner.

"All the symptoms of old age are holdovers from the change from breeder to protector," he was telling a long-dead ARM inquisitor. "Skin thickens and wrinkles; it's supposed to get like this, hard enough to turn a knife. You lose your teeth to leave room for the gums to harden. Your heart can weaken because

you're supposed to grow a second heart, two-chambered, in the groin."

Brennan's voice was a rasp. "Your joints are supposed to expand, to offer a larger moment arm for the muscles. Increased strength. But none of this works quite right without *tree-of-life*, and there hasn't been *tree-of-life* on Earth for three million—"

Louis jumped when fingers tugged at his jumper. "Luweewu! I'm hungry."

"Okay." He was tired of studying, anyway; it wasn't telling him much that was useful.

Harkabeeparolyn was still asleep. The smell of meat broiling in a flashlight-laser beam woke her. Louis dialled fruits and cooked vegetables for them, and showed them where to dump anything they didn't like.

He took his own dinner into the cargo hold.

It bothered him to have dependents. Granted that both were Louis Wu's victims. But he couldn't even teach them to get their own meals! The settings were marked in Interworld and the Hero's Tongue.

Was there any way to put them to work?

Tomorrow. He'd think of something.

The computer was beginning to deliver results. The Hindmost was busy. When Louis got his attention for a moment he asked for the records of Chmee's invasion of the castle.

The castle occupied the peak of a rocky hill. Herds of piglike beasts, yellow with an orange stripe, grazed the yellow grass veldt below. The lander circled about the castle, then settled into the courtyard in a cloud of arrows.

Nothing happened for several minutes.

Then orange blurred from several arched doorways at once, too fast to see.

They stopped, flattened like rugs and clutching weapons, against the base of the lander. They were kzinti; but they seemed distorted. There had been divergence over a quarter of a million years.

Harkabeeparolyn spoke at Louis's shoulder. "Are these your companion's kind?"

"Close enough. They seem a little shorter and a little darker, and...the lower jaw seems more massive."

"He abandoned you. Why don't you leave him?"

Louis laughed. "Why, to get you a bed? We were in battle conditions when I let a vampire seduce me. He was disgusted. As far as Chmee knows, I abandoned him."

"No man or woman can resist a vampire."

"Chmee is not a man. He couldn't possibly want *rishathra* with a vampire, or with any hominid."

Now more of the great orange cats sprinted to posts beneath the lander. Two carried a rust-stained metal cylinder. The dozen cats crept to the far side of the lander.

The cylinder disappeared in a blast of yellow-white flame. The lander slid a yard or two. The kzinti waited, then crept back to study the results.

Harkabeeparolyn shuddered. "They seem more likely to desire me for a meal."

Louis was growing irritated. "They might. But I remember a time when Chmee was starving, and he never touched me. What's your problem, anyway? Don't you get carnivores in the city?"

"We do."

"And the Library?"

He thought she wouldn't answer. (Furry faces showed at most of the slit windows. The explosion had done no visible damage.) Then, "I was in Panth Building for a time." She did not meet his eyes.

For a moment he couldn't remember. Then: Panth Building. Built like an onion floating tip down. Repairs to the water condenser. The ruler want to pay the fee in sex. Scent of vampire in the halls.

"You had *rishathra* with carnivores?"

THE RINGWORLD ENGINEERS

"With Herders and Grass People and Hanging People and Night People. One remembers."

Louis withdrew a little. "With Night People?" Ghouls?

"The Night People are very important to us. They bear information for us and for the Machine People. They hold together what is left of civilization, and we do well not to offend them."

"Uh-huh."

"But it was the... Luweewu, the Night Hunters have a very keen sense of smell. The scent of vampire sends them running. I was told that I must have *rishathra* with a Night Hunter. Without vampire scent, I asked for transfer to the Library."

Louis remembered Mar Korssil. "They don't seem repugnant."

"But for *rishathra*? We who have no parents, we must pay society's debt before we can mate and make a household. I lost my accumulated fund when I transferred. The transfer did not come soon enough." She looked up into his eyes. "It was not joyful. But other times were as bad. When the vampire scent wears off, the memory does not. One remembers the smells. Blood on the Night Hunter's breath. Corruption on the Night People's."

"You're well out of that," Louis said.

Some of the kzinti tried to stand up. Then they all fell asleep. Ten minutes later the hatch descended. Chmee came down to take command.

It was late when the Hindmost reappeared. He looked rumppled and tired. "It seems your guess was correct," he said. "Not only will *scrith* hold a magnetic field, but the Ringworld structure is webbed with superconductor cables."

"That's good," said Louis. A great weight lifted from him. "That's good! But how would City Builders know that? I can't see them digging into the *scrith* to find out."

"No, but they made magnets for compasses. They traced a gridwork of superconductor lines running in hexagonal patterns through the Ringworld foundation, fifty thousand miles across. It helped them make their maps. Centuries passed before the City Builders knew enough physics to guess what they were tracing, but their guess led them to develop their own superconductor."

"The bacteria you seeded—"

"It will not have touched superconductor buried in *scrith*. I'm aware that the Ringworld floor is vulnerable to meteorites. We must hope that none ever breached the superconductor grid."

"It's good odds."

The puppeteer pondered. "Louis, are we still searching for the secret of massive transmutation?"

"No."

"It would solve our problem very nicely," said the Hindmost. "The device must have operated on a tremendous scale. Converting matter to energy must be far easier than converting matter to other matter. Suppose we simply fired a... call it a transmutation cannon, at the underside of the Ringworld at its farthest distance from the sun. Reaction would put the structure back in place very nicely. Of course there would be problems. The shock wave would kill many natives, but many would live, too. The burned-off meteor shielding could be replaced at some later date. Why are you laughing?"

"You're brilliant. The trouble is, we don't have any reason to think there was ever a transmutation cannon."

"I don't understand."

"Harloprillilar was just making up stories. She told us so, later. And after all, how would *she* know anything about the way the Ringworld was built? Her ancestors weren't much more than monkeys when that happened." Louis saw the heads dip, and snapped, "Do not curl up on me. We don't have the time."

"Aye, aye."

"What else have you got?"

Larry Niven

"Little. Pattern analysis is still incomplete. The fantasies involving the Great Ocean mean nothing to me. You try them."

"Tomorrow."

Sounds too low to interpret held him awake. Louis turned over in darkness and free fall.

There was light enough to see. Kawareskenajok and Harkabeeparolyn lay in each other's arms, murmuring in each other's ears. Louis's translator wasn't picking it up. It sounded like love. The sudden stab of envy made him smile at himself. He'd thought the boy was too young; he'd thought the woman had sworn off. But this wasn't *rishathra*. They were the same species.

Louis turned his back and closed his eyes. His ears expected a rhythmic wave action; but it never came, and presently he was asleep.

He dreamed that he was on sabbatical.

Falling, falling between the stars. When the world became too rich, too varied, too demanding, then there came a time to leave all worlds behind. Louis had done this before. Alone in a small spacecraft, he had gone into the unexplored gaps beyond known space, to see what there was to see, and to learn if he still loved himself. Now Louis floated between sleeping plates and dreamed happy dreams of falling between the stars. No dependents, no promises to keep.

Then a woman howled in panic, right in his ear. A heel kicked him hard, just below the floating ribs, and Louis doubled up with a breathy cry. Flailing arms battered him, then closed round his neck in a death-grip hug. The wailing continued.

Louis pried at the arms to free his throat. He called, "Sleepfield off!"

Gravity returned. Louis and his attacker settled onto the lower plate. Harkabeeparolyn stopped screaming. She let her arms be pried away.

The boy Kawareskenajok knelt beside her, confused and frightened. He spoke urgent questions in the City Builder language. The woman snarled.

The boy spoke again. Harkabeeparolyn answered him, at length. The boy nodded, reluctantly. Whatever he'd heard, he didn't like it. He stepped into the corner, with a parting look that Louis couldn't interpret at all, and vanished into the cargo hold.

Louis reached out for his translator. "Okay, what's it all about?"

"I was falling!" she sobbed.

"It's nothing to be afraid of," Louis told her. "This is how some of us like to sleep."

She looked up into his face. "Falling?"

"Yah."

Her expression was easy to interpret. *Mad. Quite Mad...* and a shrug. Visibly she braced herself. She said, "I have made myself know that my usefulness is over, now that your machines can read faster than I can. I can do one thing only to make our mission easier, and that is to ease the pain of your thwarted lust."

"That's a relief," Louis said. He meant it as sarcasm; would she hear it that way? Louis was tanjed if he'd accept that kind of charity.

"If you bathe, and clean your mouth very thoroughly—"

"Hold it. Your sacrifice of your comfort to higher goals is praiseworthy, but it would be bad manners for me to accept."

She was bewildered. "Luweewu? Do you not want *rishathra* with me?"

"Thank you, no. Sleepfield on." Louis floated away from her. From previous experience he sensed a shouting match coming, and that couldn't be helped. But if she tried physical force, she'd find herself falling.

She surprised him. She said, "Luweewu, it would be terrible for me to have children, now."

He looked down at her face: not enraged, but very serious. She said, "If I mate now with Kawareskenajok, I may bring

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forth a baby to die in the fire of the sun."

"Then don't. He's too young anyway."

"No, he's not."

"Oh. Well. Don't you have—No, you wouldn't be carrying contraceptives. Well, can't you estimate your fertile period and avoid it?"

"I don't understand. No, wait, I do understand. Luweewu, our species ruled most of the world because of our command of the nuances and variations of *rishathra*. Do you know how we learned so much about *rishathra*?"

"Just lucky I guess?"

"Luweewu, some species are more fertile than others."

"Oh."

"Before history began, we learned that *rishathra* is the way not to have children. If we mate, four *jalans* later there is a child. Luweewu, can the world be saved? Do you know that the world can be saved?"

Oh, to be on sabbatical. Alone in a singleship, light-years from all responsibility to anyone but Louis Wu, Oh, to be under the wire . . . "I can't guarantee anything at all."

"Then do *rishathra* with me, to let me stop thinking of Kawareskenjajok!"

It was not the most flattering proposal of Louis Wu's young life. He asked, "How do we ease his mind?"

"There is no way. Poor boy, he must suffer."

Then you can both suffer, Louis thought. But he couldn't make himself say it. The woman was serious, and she was hurting, and she was right. This was not a time to bring a baby City Builder into the world.

And he wanted her.

He climbed out of free fall and took her to the water bed. He was glad that Kawareskenjajok had retired to the cargo hold. What would the boy have to say tomorrow morning?

BENEATH THE WATERS

LOIS WOKE UNDER GRAVITY, with a smile on his face and a pleasant ache in every muscle, and a grittiness in his eyes. He had slept very little last night. Harkabeeparolyn hadn't exaggerated her urgency. He had never known (despite his time with Halriopirillalar) that City Builders went into heat.

He shifted, and the big bed surged beneath him. A body rolled against him: Kawareskenjajok, on his belly, spread out like a starfish and snoring gently.

Harkabeeparolyn, curled in orange fur at the foot of the bed, stirred and sat up. She said, perhaps in apology at leaving him, "I kept waking up and not knowing where I was, with the bed heaving under me."

Culture shock, he thought. He remembered that Halriopirillalar had liked the sleeping field, but not for sleeping. "There's plenty of floor. How do you feel?"

"Much better, for the moment. Thank you."

"Thank you. Are you hungry?"

"Not yet."

He exercised. His muscles were still hard, but he was out of practice. The City Builders watched him with puzzled expressions. Afterward, he dialled breakfast: melon, souffles Grand Marnier, muffins, coffee. His guests refused the coffee, predictably, and also the muffins.

When the Hindmost appeared he looked rumpled and tired. "The patterns we sought are not evident in the records of the floating city," he said. "All species build their armor in the shape of a Pak protector. Armor is not the same everywhere, not quite, but the styling does not vary in any pattern. It may be we can blame the spread of City Builder culture for that. Their empire mixed ideas and inventions until we may never trace their origins."

"What about the immortality drug?"

"You were right. The Great Ocean is seen as a source of horrors and delights, including immortality. The gift is not

always a drug. Sometimes it comes without warning, bestowed by whimsical gods. Louis, the legends make no sense to me, a nonhuman."

"Set the tape up for us. I'll get our guests to watch it, too. Maybe they can explain what I can't."

"Aye, aye."

"What about repairs?"

"There has been no repair activity on the Ringworld in recorded history."

"You're kidding!"

"How large a region is covered by the city records? How long a time? Not very. Aside from that, I've studied the old interviews with Jack Brennan. I gather that protectors have long lives and very long attention spans. They prefer not to use servomechanisms if they can do a job themselves. There was no autopilot aboard Phssthpok's spacecraft, for instance."

"That's not consistent. The spillpipe system is certainly automatic."

"A very simple brute force approach. We don't know why the protectors died or left the Ringworld. Is it possible that they knew their fate, that they had time to automate the spillpipe system? Louis, we don't need to know any of this."

"Oh, yah? The meteor defense is probably automatic, too. Wouldn't you like to know more about the meteor defense?"

"I would."

"And the attitude jets were automatic. Maybe there were manual overrides for all of that. But a thousand hominid species have evolved since the Pak disappeared, and the automatics are still going. Either the protectors always intended to leave—which I can't believe—"

"Or they took many years to die," the Hindmost said. "I have my own ideas on that." And he would say no more.

Louis found fine entertainment that morning. The tales of the Great Ocean were good stuff, with heroes and royalty and feats of detection and magic and fearsome monsters, and a flavor different from the fairy tales of any human culture. Love was not eternal. The City Builders' hero's (or heroine's) companions were always of the opposite sex, their loyalty was held by imaginatively described *rishathra*, and their conveniently strange powers were taken for granted. Magicians were not automatically evil; they were random dangers, to be avoided, not fought.

Louis found the common denominators he was looking for. Always there was the vastness of the sea, and the terror of the storms, and the sea monsters.

Some of those could be sharks, sperm whales, killer whales, Gummidgy destroyers, Wunderland shadowfish, or trapweed jungles. Some were intelligent. There were sea serpents miles long, with steaming nostrils (implying lungs?) and large mouths lined with sharp teeth. There was a land that burned any ship that approached, invariably leaving one survivor. (Fantasy, or sunflowers?) Certain islands were sea beasts of sedentary inclination, such that whole ecologies would establish themselves on their backs, until a shipload of sailors disturbed them. Then they would dive. Louis might have believed that one if he hadn't seen the same legend in Earth's literature.

He did believe the ferocious storms. Over that long a reach, storms could build terribly—even without the coriolis effect that gives rise to hurricanes on any normal world. On the Map of Kzin he'd seen a ship as big as a city. It might take a ship that size to weather Great Ocean storms.

He did not disbelieve the magicians, not completely. They (in three legends) seemed to be of the City Builder race. But, unlike the magicians of Earthly legend, they were mighty fighters. And all three wore armor.

"Kawareskenjajok? Do magicians always wear armor?"

The boy looked at him strangely. "You mean in stories, don't you? No. Except, I guess that always do around the Great Ocean. Why?"

"Do magicians fight? Are they great fighters?"

"They don't have to be." The questioning was making the boy uneasy.

Harkabeeparolyn broke in. "Luweewu, I may know more of children's tales than Kawa does. What are you trying to learn?"

"I'm looking for the home of the Ringworld engineers. These armored magicians could be them, except they're too late in history."

"Then it isn't them."

"But what sparked the legends? Statues? Mummies pulled out of a desert? Racial memories?"

She thought it over. "Magicians usually belong to the species that is telling the story. Descriptions vary: height, weight, what they eat. Yet they have traits in common. They are terrible fighters. They do not take a moral stand. They are not to be defeated, but avoided."

Like a submarine beneath polar ice, *Hot Needle of Inquiry* cruised beneath the Great Ocean.

The Hindmost had slowed the ship. They had a good view of the long, intricately curved ribbon of continental shelf falling behind them. Beyond, the floor of the Great Ocean was as active as the land: mountains high enough to rise above the water; undersea canyons showing as ridges five and six miles high.

What was above them now—a pebbled roof, dark even under light-amplification, that seemed obtrusively close even though it was three thousand miles above—should be the Map of Kzin. The computer said it was. Kzin must have been tectonically active when the Map was carved. The seabeds bulged strongly, the mountain ranges were deep and sharp of outline.

Louis could identify nothing. Foam-shrouded contours weren't enough. He needed to see sunlight patterns and yellow-and-orange jungle. "Keep the camera rolling. Are you getting a signal from the lander?"

From his post at the controls the Hindmost turned one head back. "No, Louis, the *scrith* blocks it. Do you see the nearly circular bay, there where the big river ends? The great ship is moored across its mouth. Nearly across the Map, the Y-shape where two rivers join, that is the castle where the lander now rests."

"Okay. Drop a few thousand miles. Give me an overview... or underview."

Needle sank beneath its carved roof. The Hindmost said, "You made this same tour in the *Lying Bastard*. Do you expect to find changes now?"

"No. Getting impatient?"

"Of course not, Louis."

"I know more than I did then. Maybe I'll pick up details we missed. Like—What's that, sticking out near the south pole?"

The Hindmost gave them an expanded view. A long, narrow, utterly black triangle with a textured surface, it dropped straight down from the center of the Map of Kzin. "A radiator fin," the puppeteer said. "The antarctic must be kept refrigerated, of course."

The Ringworlders were utterly bewildered. "I don't understand," Harkabeeparolyn said. "I thought I knew some science, but... what is it?"

"Too complicated. Hindmost—"

"Luweewu, I am not a fool or a child!"

She couldn't be much over forty, Louis thought. "All right. The whole point is to imitate a planet. A spinning ball, right? Sunlight falls almost level at the poles of a spinning ball, so it's cold. So this imitation world has to be cooled at the poles. Hindmost, give us more magnification."

The fin's textured surface became myriads of adjustable horizontal flaps, silver above, black below. Summer and winter, he thought; and he heard himself say, "I can't believe it."

"Luweewu?"

Larry Niven

He spread his hands helplessly. "Every so often I lose it. I think I've accepted it all, and then all of a sudden it's too big. Too tanj big."

Tears were brimming in Harkabeeparolyn's eyes. "I believe it now. My world is an imitation of a real world."

Louis puts his arms around her. "It's real. Feel this? You're as real as I am. Stamp your foot. The world is as real as this ship. Just bigger. Way, way bigger."

The Hindmost said, "Louis?"

A bit of telescope work had found him more fins, smaller, around the Map's perimeter. "Naturally, the arctic regions must be cooled too."

"Yah. I'll be all right in a minute. Take us toward Fist-of-God, but take your time. The computer can find it!"

"Yes. Might we find it plugged? You said that the Eye Storm has been plugged or repaired?"

"Plugging Fist-of-God wouldn't be easy. The hole's bigger than Australia, and clear above the atmosphere." He rubbed his closed eyes hard.

I can't let this happen to me, he thought. *What happens is real. What's real, I can manipulate with my brain. Tanj. I should never have used the wire. It's screwed up my sense of reality. But... cooling fins under the poles?*

They were out from under the Map of Kzin. Deep-radar showed nothing of pipes beneath the contoured seabottoms. Which must mean that the meteor shielding was foamed *scrith*. The pipes had to be there; else *slup* would fill the ocean beds.

Those ridges on the Ringworld's underside—those long, long undersea canyons. A dredge in each of the deepest canyons, an outlet at one end: you could keep the whole ocean bed clear.

"Veer a little, Hindmost. Take us under the Map of Mars. Then the Map of Earth. It won't take us too far out of our way."

"Nearly two hours."

"Risk it."

Two hours. Louis dozed in the sleeping field. He knew that an adventurer snatches sleep when he can. He woke well ahead of time, with seabottom still gliding past above *Needle*'s roof. He watched it slow, and stop.

The Hindmost said, "Mars is missing."

[To Be Concluded]



I was cleaning my gum, and it went off!

DAISY, IN THE SUN

Connie Willis

NONE OF THE OTHERS WERE ANY HELP. Daisy's brother, when she knelt beside him on the kitchen floor and said, "Do you remember when we lived at Grandma's house, just the three of us, nobody else?" looked at her blankly over the pages of his book, his face closed and uninterested. "What is your book about?" she asked kindly. "Is it about the sun? You always used to read your books out loud to me at Grandma's. All about the sun."

He stood up and went to the windows of the kitchen and looked out at the snow, tracing patterns on the dry window. The book, when Daisy looked at it, was about something else altogether.

"It didn't always snow like this at home, did it?" Daisy would ask her grandmother. "It couldn't have snowed all the time, not even in Canada, could it?"

It was the train this time, not the kitchen, but her grandmother went on measuring for the curtains as if she didn't notice. "How can the trains run if it snows all the time?" Her grandmother didn't answer her. She went on measuring the wide curved train windows with her long yellow tape measure. She wrote the measurements on little slips of paper, and they drifted from her pockets like the snow outside, without sound.

Daisy waited until it was the kitchen again. The red cafe curtains hung streaked and limp across the bottom half of the square windows. "The sun faded the curtains, didn't it?" she asked slyly, but her grandmother would not be tricked. She measured and wrote and dropped the measurements like ash around her.

Daisy looked from her grandmother to the rest of them, shambling up and down the length of her grandmother's

Fred Kuech

kitchen. She would not ask them. Talking to them would be like admitting they belonged here, muddling clumsily around the room, bumping into each other.

Daisy stood up. "It was the sun that faded them," she said. "I remember," and went into her room and shut the door.

The room was always her own room, no matter what happened outside. It stayed the same, yellow muslin on the bed, yellow priscillas at the window. She had refused to let her mother put blinds up in her room. She remembered that quite clearly. She had stayed in her room the whole day with her door barricaded. But she could not remember why her





mother had wanted to put them up or what had happened afterward.

Daisy sat down cross-legged in the middle of the bed, hugging the yellow ruffled pillow from her bed against her chest. Her mother constantly reminded her that a young lady sat with her legs together. "You're fifteen, Daisy. You're a young lady whether you like it or not."

Why could she remember things like that and not how they had gotten here and where her mother was and why it snowed all the time yet was never cold? She hugged the pillow tightly against her and tried, tried to remember.

It was like pushing against something, something both yielding and unyielding. It was herself, trying to push her breasts flat against her chest after her mother had told her she was growing up, that she would need to wear a bra. She had tried to push through to the little girl she had been before, but even though she pressed them into herself with the flats of her hands, they were still there. A barrier, impossible to get through.

Daisy clutched at the yielding pillow, her eyes squeezed shut. "Grandma came in," she said out loud, reaching for the one memory she could get to, "Grandma came in and

said . . ."

She was looking at one of her brother's books. She had been holding it, looking at it, one of her brother's books about the sun, and as the door opened he reached out and took it away from her. He was angry—about the book? Her grandmother came in, looking hot and excited, and he took the book away from her. Her grandmother said, "They got the material in. I bought enough for all the windows." She had a sack full of folded cloth, red-and-white gingham. "I bought almost the whole bolt," her grandmother said. She was flushed. "Isn't it pretty?" Daisy reached out to touch the thin pretty cloth. And . . . Daisy clutched at the pillow, wrinkling the ruffled edge. She had reached out to touch the thin pretty cloth and then . . .

It was no use. She could not get any farther. She had never been able to get any farther. Sometimes she sat on her bed for days. Sometimes she started at the end and worked back through the memory and it was still the same. She could not remember anymore on either side. Only the book and her grandmother coming in and reaching out her hand.

Daisy opened her eyes. She put the pillow back on the bed and uncrossed her legs and took a deep breath. She was going to have to ask the others. There was nothing else to do.

She stood a minute by the door before she opened it, wondering which of the places it would be. It was her mother's living room, the walls a cool blue and the windows covered with venetian blinds. Her brother sat on the gray-blue carpet reading. Her grandmother had taken down one of the blinds. She was measuring the tall window. Outside the snow fell.

The strangers moved up and down on the blue carpet. Sometimes Daisy thought she recognized them, that they were friends of her parents or people she had seen at school, but she could not be sure. They did not speak to each other in their endless, patient wanderings. They did not even seem to see each other. Sometimes, passing down the long aisle of the train or circling her grandmother's kitchen or pacing the blue living room, they bumped into each other. They did not stop and say excuse me. They bumped into each other as if they did not know they did it, and moved on. They collided without sound or feeling, and each time they did they seemed less and less like people. Daisy knew and more and more like strangers. She looked at them anxiously, trying to recognize them so she could ask them.

The young man had come in from outside. Daisy was sure of it, though there was no draft of cold air to convince her, no snow for the young man to shrug from his hair and shoulders. He moved with easy direction through the others, and they looked up at him as he passed. He sat down on the blue couch and smiled at Daisy's brother. Her brother looked up from his book and smiled back. He has come in from outside, Daisy thought. He will know.

She sat down near him, on the end of the couch, her arms crossed in front of her. "Has something happened to the sun?" she asked him in a whisper.

He looked up. His face was as young as hers, tanned and smiling. Daisy felt, far down, a little quiver of fear, a faint alien feeling like that which had signaled the coming of her first period. She stood up and backed away from him, only a step, and nearly collided with one of the strangers.

"Well, hello," the boy said. "If it isn't little Daisy!"

Her hands knotted into fists. She did not see how she could not have recognized him before—the easy confidence, the casual smile. He would not help her. He knew, of course he knew, he had always known everything, but he wouldn't tell her. He would laugh at her. She must not let him laugh at her.

"Hi, Ron," she was going to say, but the last consonant drifted away into uncertainty. She had never been sure what his name was.

He laughed. "What makes you think something's happened to the sun, Daisy-Daisy?" He had his arm over the back of the couch. "Sit down and tell me all about it." If she sat down next

to him he could easily put his arm around her.

"Has something happened to the sun?" she repeated, more loudly, from where she stood. "It never shines anymore."

"Are you sure?" he said, and laughed again. He was looking at her breasts. She crossed her arms in front of her.

"Has it?" she said stubbornly, like a child.

"What do you think?"

"I think maybe everybody was wrong about the sun." She stopped, surprised at what she had said, at what she was remembering now. Then she went on, forgetting to keep her arms in front of her, listening to what she said next. "They all thought it was going to blow up. They said it would swallow the whole earth up. But maybe it didn't. Maybe it just burned out, like a match or something, and it doesn't shine anymore and that's why it shows all the time and—"

"Cold," Ron said.

"What?"

"Cold," he said. "Wouldn't it be cold if that had happened?"

"What?" she said stupidly.

"Daisy," he said, and smiled at her. She reeled a little. The tugging of fear was farther down and more definite.

"Oh," she said, and ran, veering, around the others milling up and down, up and down, into her own room. She slammed the door behind her and lay down on the bed, holding her stomach and remembering.

H

ER FATHER HAD CALLED THEM ALL TOGETHER in the living room. Her mother perched on the edge of the blue couch, already looking frightened. Her brother had brought a book in with him, but he stared blindly at the page.

It was cold in the living room. Daisy moved into the one patch of sunlight, and waited. She had already been frightened for a year. And in a minute, she thought, I'm going to hear something that will make me more afraid.

She felt a sudden stunning hatred of her parents, able to pull her in out of the sun and into darkness, able to make her frightened just by talking to her. She had been sitting on the porch today. That other day she had been lying in the sun in her old yellow bathing suit when her mother called her in.

"You're a big girl now," her mother had said once they were in her room. She was looking at the outgrown yellow suit that was tight across the chest and pulled up on the legs. "There are things you need to know."

Daisy's heart had begun to pound. "I wanted to tell you so you wouldn't hear a lot of rumors." She had had a booklet with her, pink and white and terrifying. "I want you to read this, Daisy. You're changing, even though you may not notice it. Your breasts are developing and soon you'll be starting your period. That means . . ."

Daisy knew what it meant. The girls at school had told her. Darkness and blood. Boys wanting to touch her breasts, wanting to penetrate her darkness. And then more blood.

"No," Daisy said. "No. I don't want to."

"I know it seems frightening to you now, but someday soon you'll meet a nice boy and then you'll understand—"

"No, I won't. Never. I know what boys do to you."

"Five years from now you won't feel this way, Daisy. You'll see—"

Not in five years. Not in a hundred. No.

"I won't have breasts," Daisy shouted, and threw the pillow off her bed at her mother. "I won't have a period. I won't let it happen. No!"

Her mother had looked at her pityingly. "Why, Daisy, it's already started." She had put her arms around her. "There's nothing to be afraid of, honey."

Daisy had been afraid ever since. And now she would be more afraid, as soon as her father spoke.

"I wanted to tell you all together," her father said, "so you would not hear some other way. I wanted you to know what is

really happening and not just rumors." He paused and took a ragged breath. They even started their speeches alike.

"I think you should hear it from me," her father said. "The sun is going to go nova."

Her mother gasped, a long, easy intake of breath like a sigh, the last easy breath her mother would take. Her brother closed his book. "Is that all?" Daisy thought, surprised.

"The sun has used up all the hydrogen in its core. It's starting to burn itself up, and when it does, it will expand and . . ." he stumbled over the word.

"It's going to swallow us up," her brother said. "I read it in a book. The sun will just explode, all the way out to Mars. It'll swallow up Mercury and Venus and Earth and Mars and we'll all be dead."

Her father nodded. "Yes," he said, as if he was relieved that the worst was out.

"No," her mother said. And Daisy thought, "This is nothing. Nothing." Her mother's talks were worse than this. Blood and darkness.

"There have been changes in the sun," her father said. "There have been more solar storms, too many. And the sun is releasing unusual bursts of neutrinos. Those are signs that it will—"

"How long?" her mother asked.

"A year. Five years at the most. They don't know."

"We have to stop it!" Daisy's mother shrieked, and Daisy looked up from her place in the sun, amazed at her mother's fear.

"There's nothing we can do," her father said. "It's already started."

"I won't let it," her mother said. "Not my children. I won't let it happen. Not to my Daisy. She's always loved the sun."

At her mother's words, Daisy remembered something. An old photograph her mother had written on, scrawling across the bottom of the picture in white ink. The picture was herself as a toddler in a yellow sunsuit, concave little girl's chest and poaching toddler's stomach. Bucket and shovel and toes dug into the hot sand, squinting up into the sunlight. And her mother's writing across the bottom, "Daisy, in the sun."

Her father had taken her mother's hand and was holding it. He had put his arm around her brother's shoulders. Their heads were ducked, prepared for a blow, as if they thought a bomb was going to fall on them.

Daisy thought, "All of us, in a year or maybe five, surely five at the most, all of us children again, warm and happy, in the sun." She could not make herself be afraid.

TWAS THE TRAIN AGAIN. The strangers moved up and down the long aisle of the dining car, knocking against each other randomly. Her grandmother measured the little window in the door at the end of the car. She did not look out the little window at the ashén snow. Daisy could not see her brother.

Ron was sitting at one of the tables that were covered with the heavy worn white damask of trains. The vase and dull silver on the table were heavy so they would not fall off with the movement of the train. Ron leaned back in his chair and looked out the window at the snow.

Daisy sat down across the table from him. Her heart was beating painfully in her chest. "Hi," she said. She was afraid to add his name for fear the word would trail away as it had before and he would know how frightened she was.

He turned and smiled at her. "Hello, Daisy-Daisy," he said.

She hated him with the same sudden intensity she had felt for her parents, hated him for his ability to make her afraid. "What are you doing here?" she asked.

He turned slightly in the seat and grinned at her.

"You don't belong here," she said belligerently. "I went to Canada to live with my grandmother." Her eyes widened. She had not known that before she said it. "I didn't even know you. You worked in the grocery store when we lived in California."

Connie Willis

She was suddenly overwhelmed by what she was saying. "You don't belong here," she murmured.

"Maybe it's all a dream, Daisy."

She looked at him, still angry, her chest heaving with the shock of remembering. "What?"

"I said, maybe you're just dreaming all this." He put his elbows on the table and leaned toward her. "You always had the most incredible dreams, Daisy-Daisy."

She shook her head. "Not like this. They weren't like this. I always had good dreams." The memory was coming now, faster this time, a throbbing in her side where the pink and white book said her ovaries were. She was not sure she could make it to her room. She stood up, clutching at the white tablecloth. "They weren't like this." She stumbled through the milling people toward her room.

"Oh, and Daisy," Ron said. She stopped, her hand on the door of her room, the memory almost there. "You're still cold."

"What?" she said blankly.

"Still cold. You're getting warmer, though."

She wanted to ask him what he meant, but the memory was upon her. She shut the door behind her, breathing heavily, and groped for the bed.

All her family had had nightmares. The three of them sat at breakfast with drawn, tired faces, their eyes looking bruised. The lead-backed curtains for the kitchen hadn't come yet, so they had to eat breakfast in the living room where they could close the venetian blinds. Her mother and father sat on the blue couch with their knees against the crowded coffee table. Daisy and her brother sat on the floor.

Her mother said, staring at the closed blinds, "I dreamed I was full of holes, tiny little holes, like dotted swiss."

"Now, Evelyn," her father said.

Her brother said, "I dreamed the house was on fire and the fire trucks came and put it out, but then the fire trucks caught on fire and the firemen and the trees and—"

"That's enough," her father said. "Eat your breakfast." To his wife he said gently, "Neutrinos pass through all of us all the time. They pass right through the earth. They're completely harmless. They don't make holes at all. It's nothing, Evelyn. Don't worry about the neutrinos. They can't hurt you."

"Daisy, you had a dotted swiss dress once, didn't you?" her mother said, still looking at the blinds. "It was yellow. All those little dots, like holes."

"May I be excused?" her brother asked, holding a book with a photo of the sun on the cover.

Her father nodded and her brother went outside, already reading. "Wear your hat!" Daisy's mother said, her voice rising perilously on the last word. She watched him until he was out of the room, then she turned and looked at Daisy with her bruised eyes. "You had a nightmare too, didn't you, Daisy?"

Daisy shook her head, looking down at her bowl of cereal. She had been looking out between the venetian blinds before breakfast, looking out at the forbidden sun. The stiff plastic blinds had caught open, and now there was a little triangle of sunlight on Daisy's bowl of cereal. She and her mother were both looking at it. Daisy put her hand over the light.

"Did you have a nice dream, then, Daisy, or don't you remember?" She sounded accusing.

"I remember," Daisy said, watching the sunlight on her hand. She had dreamed of a bear. A massive golden bear with shining fur. Daisy was playing ball with the bear. She had in her two hands a little blue-green ball. The bear reached out lazily with his wide golden arm and swatted the blue ball out of Daisy's hands and away. The wide, gentle sweep of his great paw was the most beautiful thing she had ever seen. Daisy smiled to herself at the memory of it.

"Tell me your dream, Daisy," her mother said.

"All right," Daisy said angrily. "It was about a big yellow bear and a little blue ball that he swatted." She swung her arm

toward her mother.

Her mother winced.

"Swatted us all to kingdom come, Mother!" she shouted and flung herself out of the dark living room into the bright morning sun.

"Wear your hat," her mother called after her, and this time the last word rose almost to a scream.

Daisy stood against the door for a long time, watching him. He was talking to her grandmother. She had put down her yellow tape measure with the black coal numbers and was nodding and smiling at what he said. After a very long time he reached out his hand and covered hers, patting it kindly.

Her grandmother stood up slowly and went to the window, where the faded red curtains did not shut out the snow, but she did not look at the curtains. She stood and looked out at the snow, smiling faintly and without anxiety.

Daisy edged her way through the crowd in the kitchen, frowning, and sat down across from Ron. His hands still rested flat on the red linoleum-topped table. Daisy put her hands on the table, too, almost touching his. She turned them palm up, in a gesture of helplessness.

"It isn't a dream, is it?" she asked him.

His fingers were almost touching hers. "What makes you think I'd know? I don't belong here, remember? I work in a grocery store, remember?"

"You know everything," she said simply.

"Not everything."

The cramp hit her. Her hands, still palm up, shook a little and then groped for the metal edge of the red table as she tried to straighten up.

"Warmer all the time, Daisy-Daisy," he said.

She did not make it to her room. She leaned helplessly against the door and watched her grandmother, measuring and writing and dropping the little slips of paper around her. And remembered.

Her mother did not even know him. She had seen him at the grocery store. Her mother, who never went out, who wore sunglasses and long-sleeved shirts and a sunhat, even inside the darkened blue living room—her mother had met him at the grocery store and brought him home. She had taken off her hat and her ridiculous gardening gloves and gone to the grocery store to find him. It must have taken incredible courage.

"He said he'd seen you at school and wanted to ask you out himself, but he was afraid I'd say you were too young, isn't that right, Ron?" Her mother spoke in a rapid, nervous voice. Daisy was not sure whether she had said Ron or Rob or Rod. "So I said, why don't you just come on home with me right now and meet her? There's no time like the present, I say. Isn't that right, Ron?"

He was not embarrassed by her at all. "Would you like to go get a coke, Daisy? I've got my car here."

"Of course she wants to go. Don't you, Daisy?"

No. She wished the sun would reach out lazily, the great golden bear, and swat them all away. Right now.

"Daisy," her mother said, hastily brushing at her hair with her fingers. "There's so little time left. I wanted you to have—" *Darkness and blood. You wanted me to be as frightened as you are. Well, I'm not, Mother. It's too late. We're almost there now.*

But when she went outside with him, she saw his convertible parked at the curb, and she felt the first faint flutter of fear. It had the top down. She looked up at his tanned, easily smiling face, and thought, "He isn't afraid."

"Where do you want to go, Daisy?" he asked. He had his bare arm across the back of the seat. He could easily move it from there to around her shoulders. Daisy sat against the door, her arms wrapped around her chest.

"I'd like to go for a ride. With the top down. I love the sun,"

she said to frighten him, to see the same expression she could see on her mother's face when Daisy told her lies about the dreams.

"Me, too," he said. "It sounds like you don't believe all that garbage they feed us about the sun, either. It's a lot of scare talk, that's all. You don't see me getting skin cancer, do you?" He moved his golden-tanned arm lazily around her shoulder to show her. "A lot of people getting hysterical for nothing. My physics teacher says the sun could emit neutrinos at the present rate for five thousand years before the sun would collapse. All this stuff about the aurora borealis. Geez, you'd think these people had never seen a solar flare before. There's nothing to be afraid of, Daisy-Daisy."

He moved his arm dangerously close to her breast.

"Do you have nightmares?" she asked him, desperate to frighten him.

"No. All my dreams are about you." His fingers traced a pattern, casually, easily on her blouse. "What do you dream about?"

She thought she would frighten him like she frightened her mother. Her dreams always seemed so beautiful, but when she began to tell them to her mother, her mother's eyes became wide and dark with fear. And then Daisy would change the dream, make it sound worse than it was, ruin its beauty to make it frighten her mother.

"I dreamed I was rolling a golden hoop. It was hot. It burned my hand whenever I touched it. I was wearing earrings, little golden hoops in my ears that spun like the hoop when I ran. And a golden bracelet." She watched his face as she told him, to see the fear. He traced the pattern aimlessly with his finger, closer and closer to the nipple of her breast.

"I rolled the hoop down a hill and it started rolling faster and faster. I couldn't keep up with it. It rolled on by itself, like a wheel, a golden wheel, rolling over everything."

She had forgotten her purpose. She had told the dream as she remembered it, with the little secret smile at the memory. His hand had closed over her breast and rested there, warm as the sun on her face.

He looked as if he didn't know it was there. "Boy, my psych teacher would have a ball with that one! Who would think a kid like you could have a sexy dream like that? Wow! Talk about Freudian! My psych teacher says—"

"You think you know everything, don't you?" Daisy said.

His fingers traced the nipple through her thin blouse, tracing a burning circle, a tiny burning hoop.

"Not quite," he said, and bent close to her face. Darkness and blood. "I don't know quite how to take you."

She wrenched free of his face, free of his arm. "You won't take me at all. Not ever. You'll be dead. We'll all be dead in the sun," she said, and flung herself out of the convertible and back into the darkened house.

DAISY LAY DOUBLED UP ON THE BED for a long time after the memory was gone. She would not talk to him anymore. She could not remember anything without him, but she did not care. It was all a dream anyway. What did it matter? She hugged her arms to her.

It was not a dream. It was worse than a dream. She sat very straight on the edge of the bed, her head up and her arms at her side, her feet together on the floor, the way a young lady was supposed to sit. When she stood up, there was no hesitation in her manner. She walked straight to the door and opened it. She did not stop to see what room it was. She did not even glance at the strangers milling up and down. She went straight to Ron and put her hand on his shoulder.

"This is hell, isn't it?"

He turned, and there was something like hope on his face. "Why, Daisy!" he said, and took her hands and pulled her down to sit beside him. It was the train. Their folded hands rested on the white damask tablecloth. She looked at the hands.

There was no use trying to pull away.

Her voice did not shake. "I was very unkind to my mother. I used to tell her my dreams just to make her frightened. I used to go out without a hat, just because it scared her so much. She couldn't help it. She was so afraid the sun would explode." She stopped and looked at her hands. "I think it did explode and everybody died, like my father said. I think... I should have lied to her about the dreams. I should have told her I dreamed about boys, about growing up, about things that didn't frighten her. I could have made up nightmares like my brother did."

"Daisy," he said. "I'm afraid confessions aren't quite in my line. I don't—"

"She killed herself," Daisy said. "She sent us to my grandmother's in Canada and then she killed herself. And so I think that if we are all dead, then I went to hell. That's what hell is, isn't it? Coming face to face with what you're most afraid of."

"Or what you love. Oh, Daisy," he said, holding her fingers tightly. "Whatever made you think that this was hell?"

In her surprise, she looked straight into his eyes. "Because there isn't any sun," she said.

His eyes burned her, burned her. She felt blindly for the white-covered table, but the room had changed. She could not find it. He pulled her down beside him on the blue couch. With him still clinging to her hands, still holding onto her, she remembered.

They were being sent away, to protect them from the sun. Daisy was just as glad to go. Her mother was angry with her all the time. She forced Daisy to tell her her dreams, every morning at breakfast in the dark living room. Her mother had put blackout curtains up over the blinds so that no light got in at all, and in the blue twilight not even the little summer slants of light from the blinds fell on her mother's frightened face.

There was nobody on the beaches. Her mother would not let her go out, even to the grocery store, without a hat and sunglasses. She would not let them fly to Canada. She was afraid of magnetic storms. They sometimes interrupted the radio signals from the towers. Her mother was afraid the plane would crash.

She sent them on the train, kissing them goodbye at the train station, for the moment oblivious of the long dusty streaks of light from the vaulted train-station windows. Her brother went ahead of them out to the platform, and her mother pulled Daisy suddenly into a dark shadowed corner. "What I told you before, about your period, that won't happen now. The radiation—I called the doctor and he said not to worry. It's happening to everyone."

Again Daisy felt the faint pull of fear. Her period had started months ago, dark and bloody as she had imagined. She had not told anyone. "I won't worry," she said.

"Oh, my Daisy," her mother said suddenly. "My Daisy in the sun," and seemed to shrink back into the darkness. But as they pulled out of the station, she came out into the direct sun and waved goodbye to them.

It was wonderful on the train. The few passengers stayed in their cabins with the shades drawn. There were no shades in the dining room, no people to tell Daisy to get out of the sunlight. She sat in the deserted dining car and looked out the wide windows. The train flew through forests, then branch forests of spindly pines and aspens. The sun flickered in on Daisy—sun and then shadows and then sun, running across her face. She and her brother ordered an orgy of milkshakes and desserts and nobody said anything to them.

Her brother read his books about the sun out loud to her. "Do you know what it's like in the middle of the sun?" he asked her. Yes. You stand with a bucket and a shovel and your bare toes digging into the sand, a child again, not afraid, squinting up into the yellow light.

"No," she said.

"Atoms can't even hold together in the middle of the sun.

It's so crowded they bump into each other all the time, bump bump bump, like that, and their electrons fly off and run around free. Sometimes when there's a collision, it lets off an X-ray that goes *whoosh*, all the way out at the speed of light, like a ball in a pinball machine. *Bing-bang-bang*, all the way to the surface."

"Why do you read those books anyway? To scare yourself?"

"No. To scare Mom." That was a daring piece of honesty, suitable not even for the freedom of Grandma's, suitable only for the train. She smiled at him.

"You're not even scared, are you?"

She felt obliged to answer him with equal honesty. "No," she said, "not at all."

"Why not?"

Because it won't hurt. Because I won't remember afterwards. Because I'll stand in the sun with my bucket and shovel and look up and not be frightened. "I don't know," Daisy said. "I'm just not."

"I am. I dream about burning all the time. I think about how much it hurts when I burn my finger and then I dream about it hurting like that all over forever." He had been lying to their mother about his dreams, too.

"I won't be like that," Daisy said. "We won't even know it's happened. We won't remember a thing."

"When the sun goes nova, it'll start using itself up. The core will start filling up with atomic ash, and that'll make the sun start using up all its own fuel. Do you know it's pitch dark in the middle of the sun? See, the radiations are X-rays, and they're too short to see. They're invisible. Pitch dark and ashes falling around you. Can you imagine that?"

"It doesn't matter." They were passing a meadow and Daisy's face was full in the sun. "We won't be there. We'll be dead. We won't remember anything."

Daisy had not realized how relieved she would be to see her grandmother, narrow face sunburned, arms bare. She was not even wearing a hat. "Daisy, dear, you're growing up," she said. She did not make it sound like a death sentence. "And David, you still have your nose in a book, I see."

It was nearly dark when they got to her little house. "What's that?" David asked, standing on the porch.

Her grandmother's voice did not rise dangerously at all. "The aurora borealis. I tell you, we've had some shows up here lately. It's like the Fourth of July."

Daisy had not realized how hungry she had been to hear someone who was not afraid. She looked up. Great red curtains of light billowed almost to the zenith, fluttering in some solar wind. "It's beautiful," Daisy whispered, but her grandmother was holding the door open for her to go in, and so happy was she to see the clear light in her grandmother's eyes, she followed her into the little kitchen with its red linoleum table and the red curtains hanging at the windows.

"It is so nice to have company," her grandmother said, climbing onto a chair. "Daisy, hold this end, will you?" She dangled the long end of a yellow plastic ribbon down to Daisy. Daisy took it, looking anxiously at her grandmother. "What are you doing?" she asked.

"Measuring for new curtains, dear," she said, reaching into her pocket for a slip of paper and a pencil. "What's the length, Daisy?"

"Why do you need new curtains?" Daisy asked. "These look fine to me."

"They don't keep the sun out," her grandmother said. Her eyes had gone coal-black with fear. Her voice was rising with every word. "We have to have new curtains, Daisy, and there's no cloth. Not in the whole town, Daisy. Can you imagine that? We had to send to Ottawa. They bought up all the cloth in town. Can you imagine that, Daisy?"

"Yes," Daisy said, and wished she could be afraid.

Ron still held her hands tightly. She looked steadily at him.

"Warmer, Daisy," he said. "Almost here."

"Yes," she said.

He untwined their fingers and rose from the couch. He walked through the crowd in the blue living room and went out the door into the snow. She did not try to go to her room. She watched them all, the strangers in their endless, random movement, her brother walking while he read, her grandmother standing on a chair, and the memory came quite easily and without pain.

"You want to see something?" her brother asked.

Daisy was looking out the window. All day long the lights had been flickering, even though it was calm and silent outside. Their grandmother had gone to town to see if the fabric for the curtains had come in. Daisy did not answer him.

He shoved the book in front of her face. "That's a prominence," he said. The pictures were in black and white, like old-fashioned snapshots, only under them instead of her mother's scrawled white ink it said, "High Altitude Observatory, Boulder, Colorado."

"That's an eruption of hot gas hundreds of thousands of feet high."

"No," Daisy said, taking the book into her own lap. "That's my golden hoop. I saw it in my dream."

She turned the page.

David leaned over her shoulder and pointed. "That was the big eruption in 1946 when it first started to go wrong only they didn't know it yet. It weighed a billion tons. The gas went out a million miles."

Daisy held the book like a snapshot of a loved one.

"It just went, *bang*, and knocked all this gas out into space. There were all kinds of—"

"It's my golden bear," she said. The great paw of flame reached lazily out from the sun's black surface in the picture, the wild silky paw of flaming gas.

"This is the stuff you've been dreaming?" her brother asked. "This is the stuff you've been telling me about?" His voice went higher and higher. "I thought you said the dreams were nice."

"They were," Daisy said.

He pulled the book away from her and flipped angrily through the pages to a colored diagram on a black ground. It showed a glowing red ball with concentric circles drawn inside it. "there," he said, shoving it at Daisy. "That's what's going to happen to us." He jabbed angrily at one of the circles inside the red ball. "that's us. That's us! Inside the sun! Dream about that, why don't you?"

He slammed the book shut.

"But we'll all be dead, so it won't matter," Daisy said. "It won't hurt. We won't remember anything."

"That's what you think! You think you know everything. Well, you don't know what anything is. I read a book about it and you know what it said? They don't know what memory is. They think maybe it isn't even in the brain cells. That it's in the atoms somewhere and even if we're blown apart that memory stays. What if we do get burned by the sun and we still remember? What if we go on burning and burning and remembering and remembering forever?"

Daisy said quietly, "He wouldn't do that. He wouldn't hurt us." There had been no fear as she stood digging her toes into the sand and looking up at him, only wonder. "He—"

"You're crazy!" her brother shouted. "You know that? You're crazy. You talk about him like he's your boyfriend or something! It's the sun, the wonderful sun who's going to kill us all!" He yanked the book away from her. He was crying.

"I'm sorry," Daisy was about to say, but their grandmother came in just then, hatless, with her hair blowing around her thin sunburned face.

"They got the material in," she said jubilantly. "I bought enough for all the windows." She spilled out two sacks of red gingham. It billowed out across the table like the northern lights, red over red. "I thought it would never get here."

Daisy reached out to touch it.

She waited for him, sitting at the white-damask table of the dining car. He hesitated at the door, standing framed by the snow of ash behind him, and then came gaily in, singing.

"Daisy, Daisy, give me your theory do," he sang. He carried in his arms a bolt of red cloth. It billowed out from the bolt as he handed it to her grandmother—she standing on the chair, transfixed by joy, the pieces of paper, the yellow tape measure fallen from her forever.

Daisy came and stood in front of him.

"Daisy, Daisy," he said gaily. "Tell me—"

She put her hand on his chest. "No theory," she said. "I know."

"Everything, Daisy?" He smiled the easy, lopsided smile, and she thought sadly that even knowing she would not be able to see him as he was, but only as the boy who had worked at the grocery store, the boy who had known everything.

"No, but I think I know." She held her hand firmly against his chest, over the flaming hoop of his breast. "I don't think we are people anymore. I don't know what we are—atoms stripped of our electrons maybe, colliding endlessly against each other in the center of the sun while it burns itself to ash in the endless snowstorm at its heart."

He gave her no clue. His smile was still confident, easy. "What about me, Daisy?" he asked.

"I think you are my golden bear, my flaming hoop, I think you are Ra, with no end to your name at all, Ra who knows everything."

"And who are you?"

"I am Daisy, who loved the sun."

He did not smile, did not change his mocking expression. But his tanned hand closed over hers, still pushing against his chest.

"What will I be now, an X-ray zigzagging all the way to the surface till I turn into light? Where will you take me after you have taken me? To Saturn, where the sun shines on the cold rings till they melt into happiness? Is that where you shine now, on Saturn? Will you take me there? Or will we stand forever like this, me with my bucket and shovel, squinting up at you?"

Slowly, he gave her hand back to her. "Where do you want to go, Daisy?"

Her grandmother still stood on the chair, holding the cloth as if it were a benediction. Daisy reached out and touched the cloth, as she had in the moment when the sun went nova. She smiled up at her grandmother. "It's beautiful," she said. "I'm so glad it's come."

She bent suddenly to the window and pulled the faded curtains aside, as if she thought because she knew she might be granted some sort of vision, might see for some small moment the little girl that was herself—with her little girl's chess and toddler's stomach—might see herself as she really was: Daisy, in the sun. But all she could see was the endless snow.

Her brother was reading on the blue couch in her mother's living room. She stood over him, watching him read. "I'm afraid now," Daisy said, but it wasn't her brother's face that looked back at her.

"All right, then," Daisy thought. "None of them are any help. It doesn't matter. I have come face to face with what I fear and what I love and they are the same thing."

"All right, then," Daisy said, and turned back to Ron. "I'd like to go for a ride. With the top down." She stopped and squinted up at him. "I love the sun," she said.

When he put his arm around her shoulder, she did not move away. His hand closed on her breast and he bent down to kiss her.

—G—

PHANTOM'S HELL
[Continued from page 47]

up Able.

"It didn't hurt Proteus," Frank said. "He lives deep underground. The bullet merely stunned this apparition."

Philip turned slowly, looking at Frank as if he were a particularly repulsive specimen in a culture dish. "Who is it you kill most often, Frank?"

"I've . . . never killed anyone."

"No? In God's sight, the thought is the same as the deed."

"I don't kill," Frank repeated softly. He was staring into the distance, at the mountains far away with the bloated sun resting just above the jagged peaks. "I just—"

His words were cut off by a scream; a high pitched scream of tortured agony.

Both men whirled. Sixty meters away, Helen Navgy struggled to pull herself from the grasp of a small boy. Her screams were an incessant plea. As they watched, the apparition grew until it achieved the stature of an adult. The shadow of the struggling couple formed a convulsed blob behind them.

Frank drew his gun but dared not risk a shot. With nothing else to do, he started to run, jumping the smaller pools of hot water and mud, splashing through the maze of trickling, shallow streams. His path wound erratically around the larger obstacles. He knew with certainty that he could not reach her in time.

He was only halfway there when an incredibly thin beam of light burned past his ear. For one horrible instant he thought he would stagger into it, but he caught his balance with a jerk and stumbled in the opposite direction. The laser beam was a continuous line, passing just above Helen Navgy's head, boring into the neck of the apparition. The apparition stood for what seemed endless seconds before abruptly collapsing. Released, Helen fell back, landing half in a scalding hot spring. She didn't move.

Reaching her, Frank dragged her to higher ground, out of reach of the apparition. He could not bring his eyes to focus on her acid-ravaged arms. His fingers fumbled with the first aid kit at his belt until he forced himself to move more slowly. Finally, he brought out a canister. Lifting her arms carefully, one by one, he sprayed them until they were completely covered with a foam that quickly hardened to form a healing casing. He ripped off the top of her dress, which was ragged and half eaten away, to expose raw, reddened breasts. The damage here was minor compared with her arms. He applied the foam again, and then along her jaw, across her cheek and up over her left ear.

He threw the canister away and snapped the com unit from its cradle on his belt. Activating the power, he thumbed the signal button. There followed a long minute of waiting. He wiped sweat from his forehead, only partly aware that the Disciple stood next to him, staring down. Finally, he received an answer.

"Melissa? Damn it, where have you been? No, never mind. Tell Andy to fly down here and pick us up. Mrs. Navgy's been hurt. Yes, bad. We have to get her to the hospital. Hurry!"

With that done he turned his attention back to Helen. She was still unconscious but showed signs of waking. He could not allow that because they still must move her to a spot where the copter could land. He reached for the first aid kit again and gave her an injection to keep her out.

They laid Helen Navgy gently on the path, near a small clearing of firm ground. Frank folded up his shirt in an effort to pillow her head.

"That's all I can do," he said.

"You probably saved her life." The Disciple's voice seemed almost to carry respect.

"I'm the one who nearly killed her in the first place. I wasn't

watching her."

"We both share responsibility in that, Frank."

"Great! Now we can both feel guilty. It won't do her a damn bit of good!"

The sun had gone down behind the mountains, leaving them in shadowy twilight. Their position was close to where they had seen the first apparition. Both men gazed across the stream called Styx at Frank's home. The geodesic domes were still in sunlight and they saw the glint of the copter as it rose above the house.

"I wonder what took them so long?" asked the Disciple.

"I know what it was," Frank answered.

He glanced around and found the apparition of Melissa waiting for him, as expected. Deep black hair, white jumper, her fingers played a nervous game with each other.

"Mrs. Daemon! What—" The Disciple stopped suddenly. "So," he whispered, "it was your wife we saw in those apparitions."

"Yes."

"I'm not sure I understand. Melissa looked very much alive this afternoon."

"Depends on how you look at it."

"Frank, please! Don't say those kinds of things," said the apparition. "This is hard for me. "I—"

"But not too hard, eh 'Liss?'"

"Frank—" Her expression was agony. "I'm sorry. I'm going with Andy. Maybe it would be different if you came with me; if you got away from Proteus."

Frank glanced to where the copter was approaching. "Go, then," he said.

"Proteus is picking that up from Melissa?" the Disciple asked, also looking to the copter.

"Yes, it's always that way."

"I see." The look of pity was out of place on that face which was usually so impulsive. "You are a fool, Frank."

Frank shrugged. "You have made up your mind about Phantom's Hell."

"Melissa is right. You should go with her."

"I'm not leaving," Frank said, turning to walk away.

"Why, Daemon? Are you that dependent on Proteus?"

There was no answer.

"Don't you want to know my decision?"

Still no answer.

"I will not destroy Proteus, but I will put a ban on Phantom's Hell. Anyone coming here with face excommunication."

"So excommunicate me, then," Frank said, without looking back.

A gun appeared in Philip's hand. It was not the laser he had used earlier. He aimed, pulled the trigger, and Frank Daemon slumped in mid-stride, sprawling, a limp body on the path.

"Unlike you, Frank," the Disciple said to himself, "I kill, But not someone I like."

He slipped the stunner into the clip on his arm.

A few minutes later, when the copter landed, he was not surprised to find Melissa Daemon in the co-pilot's seat. They exchanged looks before she raised her head to her own apparition. She stared with a weary resignation, unsurprised.

In the deepening dark, as the Disciple and Andy Wander carried the two unconscious bodies to the copter, Proteus activated all his apparitions. Scattered along the path in the eerie evening gloom were seven Melissa Daemons. Seven Melissa voices pleaded with them to let Frank stay. Andy Wander shivered, keeping his eyes steadfastly on the copter. When the bay door slid shut, the Disciple stared out the window at Phantom's Hell. Dimly, he thought, he could still hear the voices.

"I don't believe we are ready for you, Proteus."

Inside his mind there was finally quiet. His conscience agreed with him.

—G—

The Aleph

Andrew A. Whyte

For the sake of brevity and convenience, certain abbreviations have been supplied as a reference code. They will be found on the right-hand side. Here is a key: (C) Collection (more than one story by the same author); (C+) Story series collected or collection with unifying theme; (F) Fantasy; (J) Juvenile; (O) Omnibus (Collection containing at least one novel). Since SF novels make up the majority of books listed, none of these are specified as such. We have recently added new symbols to deal with the increasing amount of illustrated fiction. (GN) Graphic Novel; (GS) Graphic Story; and (GC) Graphic Collection—are used to denote books of which approximately equivalent portions are shared between text and artwork.

ADLER, Paul
Saucer Hill
Avon/October/\$1.95

A new author takes us to future Earth, whose inhabitants are dying off due to oxygen shortages, warfare, and mass suicide.

ALDISI, Brisin (text) (GS, verse)
WILKS, Mike (art)
PILE: Petals from St. Klaed's Computer
Holt, Rinehart & Winston (Pierrot
Press)/October/\$7.95 (paper)

The artwork by a new English artist takes precedence over the [allegorical epic poem] that accompanies it, the eminence of its author notwithstanding. Pile appears to be an ultimate futuristic city which succumbs to the evils of endless expansion. The book measures nine by eleven inches and has thirty-six pages (four in color). Another work by Wilks (IN GRANNY'S GARDEN) will follow in the spring.

ANDERSON, Poul (F)
The Merman's Children

The expansion of Christianity in the late 13th century has forced the last survivors of Faerie into exile. Set roaming when their undersea home is rendered uninhabitable through exorcism, the offspring of a merfolk king and a mortal woman must seek sanctuary in a hostile world of Vikings, Crusaders, and fearful peasants.

A Stone in Heaven
[Dominie Flandy series IV]
Ace/October/\$5.95

In this final story in the series, Flandy is an admiral and in his sixties. The Long Night, in which galactic civilization will collapse, is close at hand. Approached for assistance, Flan-

dry does what he can in the face of the decadent Empire's indifference. Featured (according to SF Review) is a Jupiter-sized world with an Earthlike atmosphere, an "impossibility" which the author enjoyed demonstrating "all necessarily so."

ASPRIN, Robert (F)
Myth Conceptions
[Aesz & Skeev series, No. 2]
Illustrated by Kelly Freas
Starblaze/September/\$4.95

Further comic adventures in other dimensions of a would-be magician and his demonic associate. See the anthology section for another Asprin project and next issue's Aleph for news of his forthcoming collaboration with Star Trek's Sulu, George Takei.

BACHMAN, Richard
The Long Walk
NAL Signet/July/\$1.95

The national sport of a future American conservative tyranny is the marathon walk. The single winner is the only survivor; all other competitors

are dispatched by soldiers on following halftracks. They shoot failures, don't they? (cf. ROLLERBALL, DEATH-SPORT 2000).

BAKER, Scott
Nightshift
Berkeley-Putnam/September/\$10.95

Bizarre far-future adventure with much exotic detail by the author of SYMBIOTE'S CROWN, one of 1978's more intriguing debuts. The planet Agenbrite is dominated by the priesthood of the goddess Night. Their elaborate arcane rituals conceal the fact that the real masters are the Lha, an ancient race of "psychic vampires" from the planet Nosferatu.

BEAR, Greg
Psychones
Ace/October/\$1.95

A "contemporary SF horror novel." Some kind of new malevolent psychic entity causes people to go mad and commit acts of inordinate violence. When the population of a small town is exterminated, various groups investigate, from scientists to psychics, all has something to do with Hiroshima. The unlikely events are apparently believably and chillingly depicted and a balance between the rational and supernatural maintained. This is the second novel by the author whose book-length debut was the recent HEGIRA.

BICKERTON, Derek
Klung of the Sea
Random House/August/\$8.95

A young graduate student decides to study dolphins "in the field." When his experiment in communication is unsuccessful, he finds himself reluctant to leave their company.

BISHOP, Michael
Transfigurations
Berkeley-Putnam/October/\$10.95
SF Book Club/Jan. 1980/\$3.50 +
Revision and expansion of "Death and
Designation Among the Asadi."

The novella on which this book is based made many readers aware of the now prolific author for the first time.

BLACK, Campbell
Brainfire
Morrow/August/\$10.95

Described as "by far the best of the current wave of extraterrestrial espionage thrillers". The Russians have a reluctant secret weapon in the person of a sweet little old lady who can think people to death. Like the President, maybe...

BLOCH, Robert
There Is a Serpent in Eden
Zebra/September/\$2.25

Some evil influence is wreaking havoc in a luxurious planned community. Everything was normal in Eden until the day the red panel truck entered the gates... This is being published as contemporary suspense, but it is probably SF.

BODGER, Joan (F/J)
Clever-Lazy: The Girl Who Invented
Herself
Argo/September/\$8.95

Offbeat non-sexist fantasy with touches of SF, about the career of a female engineer who leaves her childhood village to earn her living in the Imperial City. Given a workshop in the palace, and [on being clever, she forgets to think things over and invents gunpowder]. Shortly thereafter, she is in flight (across a dragon-haunted landscape to the shrine of the Goddess in the Dancing Mountains).

BONHAM, Frank (J)
The Forever Formula
Dutton/October/\$7.95

For ages 10 to 14.

Cryogenically frozen in 1984, young Evan Clark wakes 180 years later in a world dominated by an overage minority (kept alive by a drug invented by his father) who are persuaded that his memory holds the secret to eternal life.

BRADBURY, Ray (C+)
The Martian Chronicles
Bantam/September/\$5.95
Special trade-sized (large-format) edition illustrated by Ian Miller.

This long-intended project has been resurrected, presumably as a tie-in with the upcoming TV miniseries.

BRIGGS, Raymond (F)
Fungus the Bogeyman
Random House/August/\$4.95
First publication in UK (1978)
Illustration by the author.
A day in the life of Fungus, his wife, Midew, and their young son, Mould. It will grow on you (it was a big hit in England, for all ages).

BURNHAM, Jeremy (F/J)
RAY, Trevor
Children of the Stones
Scribner's/September/\$8.95
For ages 12 and up. First published in UK.

CALDECOTT, Moyra (F)
The Lily and the Bell
Hill & Wang/August/\$8.95
The forces of darkness and light contend in Minoan Crete through the female leaders of two opposing cults. By the author of the "Standing Stones Trilogy."

CARTER, Lin (F)
Tara of the Twilight
[First in a series]
Zebra/September/\$2.25

Postponed from 1978, several times. It is an unabashedly pornographic, sexist sword-and-sorcery novel introducing the beautiful and sensuous Tara. Her long, shapely, catlike legs slid into the delicious, warm curve of hips and her breasts were full, firm and wonderfully soft. But Tara was raised to be a fighting woman, not some man's pampered pet and plaything. For she had pledged herself a War Maid, a virgin swordswoman sworn to the Moon.]

CHANDLER, A. Bertram
The Broken Cycle
[Grimes series]
DAW/October/\$1.75

Career space sailor Grimes and policewoman Una Freeman play Adam and Eve in an alternate Eden created by a godlike robot spacecraft. This latest adventure [combines the lure of a nudist colony with the confusion of a bicycle race], according to Mrs. W.

CHERRYH, C.J.
Hestia

DAW/September/\$1.95

An "unexpected," "hard core" SF novel by a now-established author. [An engineer from Earth arrives to save the doomed colony on far Hestia, only to find himself in deadly conflict with desperate colonists and the planet's hostile natural life.]

CHERRYH, C.J.
The Faded Sun: Katalia
[Third in a trilogy]
SF Book Club/\$2.49 +
Forthcoming from DAW

THE FADED SUN: KESRITH, first of a series of a continuous narrative of which this book is the completion, currently nominated for the Hugo Award for best SF novel of 1978. Whether that will jeopardize consideration of the work as a whole remains to be seen. There are always publishing considerations. More later.

CLARKE, Arthur C. (C+)
The Lost Worlds of 2001
Introduction by Foster Hirsch
Gregg Press/September/\$12.50

COFFMAN, C.C.
Spacecat One
Illustrations by Kay Niman Tish
Vantage/June/\$6.50
Vanity press publication.

COMPTON, D.G.
Windows
Berkeley-Putnam/September/\$10.95
Sequel to THE UNSLEEPING EYE which was published in the UK as THE CONTINUOUS KATHERINE MOR-TENHOE

"The Man With the TV Eyes," Rod was a reporter of another kind in a somewhat vaguely described future extent of some of today's less attractive aspects. Intimidated into accepting the technological marvels that allowed him (and through him, the entire morbidly curious planet) to witness the last days of a dying woman, Rod—when her end finally came—burned out his expensive new eyes in violent self-revulsion.

COWPER, Richard
The Road to Corlay
Pocket Books/September/\$1.95
This edition contains "The Piper at the Gates of Dawn," original "seed" story.

This is another post-cataclysmic, neo-medieval future world whose setting enables the author to evoke a quasi-historical atmosphere.

deCAMP, L. Sprague (C+)(F)
The Purple Pterodactyl: The Adventures of W. Wilson Newbury, Ensoiled Financier
Fantasia Press/October/

DELANY, Samuel R. (C+)(F)
Tales of Neverym
Banana/September/\$1.95
Five interconnected stories, set in an ancient otherwhere resembling the Rome of Petronius' SATYRICON, this marks a departure from the author of

DAHLGREN and TRITON, and perhaps a return to the mass-audience popularity he earlier enjoyed. Originally described as "sword and sorcery pastiches," these stories do not readily bring to mind any others in the genre.

DICKS, Terrance (adaptor)
Doctor Who and the Talons of Weng-Chiang
[Dr. Who series, No. 7]
Pinnacle/September/\$1.75

To the everyday perils of life in Victorian London are added the diabolical deprivations of the deformed Magnus Greel (posing as a Chinese God) and his sinister banchmen.

The Adventures of Doctor Who
SF Book Club (Nelson Doubleday)

alternate/October/\$3.98+

Comprises: "Doctor Who and the Genetics of the Daleks", "Doctor Who and the Revenge of the Cybermen", "Doctor Who and the Loch Ness Monster."

DICKSON, Gordon R.
Masters of Eternus
SF Book Club (Nelson Doubleday)/July

\$2.49+

To be published by Ace in early 1980.

This is a "Heinlein juvenile"-type story with a young hero who finds himself on the home planet of his alien pet with whom he shares an extra-sensory rapport, while trying to uncover the truth behind his brother's death, despite the lack of encouragement from the Corps who are hiding something.

DICKSON, Gordon R. (C+)
The Spell of Dorsai

Illustrations by Fernando Fernandez

The Childe Cycle, as it is properly titled, is an elaborate construction still in process. Novels already published in the series include NEGRONIACER (NO ROOM FOR MAN), TACTICS OF MISTAKE, DORSAI! (THE GENETIC GENERAL) and SOLDIER, ASK NOT. THE FINAL ENCYCLOPEDIA has been tentatively promised for 1981. This heavily illustrated large-format volume is conceived as a kind of centerpiece.

DODDERIDGE, Eame
The New Gulliver
Taplinger/September/\$9.95

A futuristic Gulliver, the sole survivor of the crash of a government spaceship on a secret mission, finds himself in Vralibran, [an advanced matriarchal society whose sex roles and conduct are the very mirror image of our own.]

DRAKE, David (F)
The Draug Lord
Berkeley-Putnam/September/\$10.95

To follow from August.

An anti-romantic Arthurian fantasy by an author whose talent for realistic military narrative may be seen in the recent SF collection HAMMER'S SLAMMERS.

EFFINGER, George Alec
Heroes
Doubleday/September/\$7.95

Title in manuscript: "Teflon".

More wacky, good-natured surprises from a determinedly offbeat writer. Effinger's heroine has spent her lifetime in a future utopian America, her boredom unrelied but for her passion in collecting depression-era glassware. Setting out at eighty-two on a pastoral pilgrimage across the country, she encounters Glorian, a

character from the author's outrageous first novel, WHAT ENTROPY MEANS TO ME.

EISENSTEIN, Phyllis
Shadow of Earth
Dell/September/\$2.25

[An alternate world adventure in which the English fleet did not defeat the Spanish Armada in 1588!] The heroine, Celia, acting as a guinea-pig for her scientist brother, finds herself [a slave, the unwilling consort of a nobleman and a very frightened pregnant woman] in a barbaric society out of the pages of parallel history. By the author of SORCERER'S SON and the ALARIC stories.

FARMER, Philip Jose
Dark is the Sun
delRey/September/\$9.95

Fifteen billion years in the future on an all but unrecognizable Earth, Soul Egg (without which one has no identity) grow on trees. When young Dey's Egg is stolen, he sets out to recover it, joined along the way by a girl and a wise plantman who are also victims of the same thief.

Jesus on Mars
Pinnacle/September/\$1.95

This novel was originally a part of the Futorian Series (now discontinued)—Pimble's only SF these days is Dr. Who and Richard Blade. Since the publisher rejected all of the selections chosen by Robert Silverberg, this must date from the time of Roger Elwood.

Image of the Beast
&
Blown
Playboy Press/November/\$2.25
Reissue/2 Novels

Originally published in 1968 by a small California publishing house specializing in "adult reading" (i.e., literate erotic fiction, generally marketed only as pornography), this two-part novel has been in demand, if only for its unavailability (despite the recent importation of British editions). Herald Childe, byronic L.A. private eye, investigating when his partner is brutally murdered by a weird occult sect, uncovers a nest of demonic perversions, shape-changers, a bad scene. Despite the description, it is SF.

FISHER, Paul
The Ash Staff
Atheneum/August/\$8.95

For ages 8 to 12.

First in a trilogy, written when the author was sixteen, set in Resten, a land resembling Wales that is blighted by an evil wizard. When their mentor dies, the eldest of six orphans inherits his staff and discovers a magic talking sword.

FISK, Nicholas (J)
Escape from Splatterbang
Macmillan/August/\$6.95

For ages 10 to 14. First publication in UK (1978).

A thirteen-year-old boy is stranded on a hostile planet whose terrible secret makes escape impossible. By the author of GRINNY, TRILLIONS and other suspenseful SF juveniles.

FOSTER, M.A.
The Day of the Kleesh
[Third in series about the 'Ier']
DAW/October/\$2.25

The 'Ier' are a genetically engineered superrace who have rebelled against ill-treatment by normal humans and abandoned Earth for a new home in the stars.

GASKELL, Jane
Strange Evil
Pocket Books/July/\$1.95

Kim's Daughters
Pocket Books/August/\$1.95

Two early heroic fantasies by the author of the Atlan series which are, I believe, being published in this country for the first time. Admirers will forgive "youthful idiosyncrasies."

GOLDSMITH, Howard (J)
Invasion! 2209 A.D.
Doubleday Signal Books/September/\$5.95

For ages up to 14.

A 23rd-century Earth, divided by hostility between farmers and city-dwellers, is threatened by the invasion of [the Tuks, an evil warlike race from a distant star.

GOSLER, John (illustrations)
Stories from Outer Space
Book Sales, Inc. (Collector's Bookshelf Series)/August/\$4.98

HAJIBLUM, Isidore
The War is Among Us
Dell/September/\$1.95
Reprint/Novel (substantially revised for this publication.)

HAMPSON, Frank (GS)
BELLAMY, Frank
Dan Dare: The Man from Nowhere
[Dan Dare, Pilot of the Future series #1]
Dragon's Dream (dist. by Big O)
August/\$8.95 (paper)
Postponed from 1978.

HARRISON, Harry (text)
BURNS, Jim (art)
Planet Story
Prietor Press (dist. by A/W)/October

\$19.95 & \$10.95

Antic adventures in the vein of Harrison's celebrated BILL, THE GA-LACTIC HERO, suitably illuminated by one of the most imaginative newer British artists, whose paperback covers were often posters in the bedsheet-sized SF Monthly. Come to think of it, maybe Harrison wrote the story after seeing Harrison's paintings.

HERZOG, Arthur
Glad To Be Here
Lippincott/October/\$8.95
[sequel to MAKE US HAPPY]

HILDEBRANDT, Greg
HILDEBRANDT, Tim
NICHOLS, Jerry
Urahak
Illustrations by the Hildebrands (16 full-color, 40 black-and-white)
Bantam/September/\$8.95
Book-of-the-Month Club Alternate
Quality Paperback Book Club Main Selection

Twin brothers who came to the public's attention primarily as illustrators of Tolkien have decided to write their own Tolkiennesque fantasy with the help of a friend. This luxuriously illustrated volume will be one of the most heavily promoted books of the fall and is likely to come to the attention of many people who ordinarily are not attracted to the genre.

HUGHES, Robert Don (F)
The Prophet of Lamath
Ballantine-delRey/October/\$1.95

Lighthearted fantasy by an author in the whimsical vein of Peter Anthony's "Xanth" series and Dickson's THE DRAGON AND THE GEORGE.

ING, Dean
Soft Targets
Ace/October/\$4.95

Portions previously published in Destinies as "Very Proper Charlies"

An immediate future study of international terrorism which could easily have been published as a political thriller. Editor Baen seems to be making a point that Soft Targets is SF because of Ing's proposed solution to the problem: free media access is often given to these undesirables; why not turn the tables through a sophisticated campaign of organized ridicule?

IRELAND, David
A Woman of the Future
Braziller/August/\$10.95

A vision of a nightmare future by a well-regarded Australian author. Althea is a "gallant" young woman of the elite Servant Class in a rigidly hierarchical society who finds her brutal, lovesick environment no longer tolerable and makes a heroic attempt to escape. PW says the sex scenes are notably shocking. Some aspects of the novel sound as phantasmagorical as fellow-Australian David Linsay's VOYAGE TO ARCTURUS.

JARRETT, David (F)
Withdrawing
Warner/September/\$1.95
First published in UK (1979) by Sphere (text slightly different)

Heroic fantasy by a new author featuring a princely hero (of the royal house of Tum-Barium) who, the victim of a curse, was born with the crippled limb of a swan. There are (glowing stones of power, subterranean hordes, bloody battles, and black sorcery.) The final revelation of the nature of the real powers behind it all abruptly qualifies the novel as science fiction. New Frazetta cover.

JONES, Diana Wynne (F/J)
The Spellcoats
Argo/August/\$7.95
Third of five books set in Daledmark.

Fantasy set in the prehistory of the land described in the author's CART AND CWIDDER and DROWNED AM-MET.

KIRK, Russell (F)
Lord of the Hollow Dark
St. Martin's Press
October/\$10.95

A legend-haunted labyrinth beneath Blagrummo Lodging (a great decaying building outside Edinburgh) is to be the setting for a strange and sinister ritual.

LARSON, Glen A.
THURSTON, Robert
The Tomb of Kobol
[Battlestar Galactica series, No. 3]
Berkeley/September/\$1.95
Starbuck gets left behind. So does the series. A moment of Cyolys, please. Stick transit gloriou mundi.

LEGUIN, Ursula K.
Maihendra
[companion to ORSINIUS TALES]
Berkeley-Putnam/October/\$11.95

A marginal inclusion. Like Islandia, Orsinia is a country that doesn't exist. But the latter's flora and fauna are unexceptional.

LESSING, Doris (F)
Re: Colonized Planet 5 — SHIKASTA
Personal, Psychological, Historical
Documents Relating to Visit by Jober
(George Sherban) Emissary (Grade 9)
87th of the Period of the Last Days
[Canopus in Argus Archives: Vol. One]
Knopf/October/\$10.95

GALILEO 81

LEVIN, Betty (F)(J) MEYERS, Richard
Landfall
Margaret K. McElberry
August '89
For ages 12 and up.
On the Scottish island of Kelds, an accident involving a grey seal connects a modern crime with an ancient myth.

LLEWELLYN, Edward (F)(J) The Douglas Convolution
DAW/October '\$1.75
A gifted mathematician and former Marine takes on a new identity when he is transported into the barbaric future world of 2170. Twentieth-century "primitivism" comes to the rescue in this old-fashioned-sounding first fictional effort by a doctor who has pursued careers in pharmacology, community and aerospace medicine as well as electrical engineering.

LORD, Jeffrey (F)(J) Pirates of Gehar
[Richard Blade series, No. 32]
Pinacle/October '\$1.50
With a new device, Blade lands on an ancient Phoenician merchant ship, passing as an historian from the future.

MCKILLIP, Patricia A. (F)(O) Riddle of Stars
SF Book Club/[Nelson Doubleday]
October '\$4.98 +
Comprises: "The Riddle-Master of Ged," "Heir of Sea and Fire," "Harpist in the Wind."

MACAULAY, David (GS) Model of the Mysteries
Houghton, Mifflin/October '\$8.95 & \$4.95
Macaulay is the author/artist of such meticulous visual dissections of urban structures, ancient and modern, as CASTLE, CITY, PYRAMID and UNDERGROUND. An impish sense of humor always present in his work (notice the details) surfaced last year with the aptly titled GREAT MENTS IN ARCHITECTURE.

MACAULEY, Robie (F)(J) A Secret History of Time to Come
Knopf/September '\$8.95
SF Book Club/November '\$3.50 +
A former fiction editor of Playboy has turned to post-cataclysmic SF. After a apocalyptic race war, what was once America is, centuries from now, a barren wilderness of isolated settlements and newly emerging tribal nations.

MACLEAN, Katherine (C) The Trouble With You Earth People
Illustrations by Kelly Freas
Starblaze/September '\$4.95
MALZBERG, Barry N. (C) Malzberg At Large
Ace/September '\$1.95
The "essential" Malzberg. ("Final War," of course, included).

MAYHAR, Ardath (F) How the Gods Were in Kyrassos
Doubleday/October '\$7.95
The pastoral existence of the Raithes, a peaceful people (living cloistered in a magical forest) is threatened by the greed of the King of the City of Lirith, who covets their powerful horses. Shanna, one of a handful of survivors of a brutal raid, is the heroine who eventually confronts the tyrant. This new author, who makes her home in Chireno, Texas, has a proper-sounding name for an author of fantasy.

MEYERS, Richard (F) Doom Star 2
Carlyle/October '\$1.95
STAR WARS-inspired space adventure.

MONACO, Richard (F) The Grail War
[Sequel to PARSIVAL]
Simon & Schuster/September '\$9.95
Wallaby/September '\$5.95
Arthurian fantasy with a contemporary tone.

MORELL, David (F) The Totem
Evans/September '\$8.95
A mysterious virus transforms its victims into murdering monsters who terrorize a small Wyoming town.

NORTH, Edmund (F) COEN, Franklin [adaptors]
Meteor
Warner/October '\$2.25

PARENTEAU, Shirley (J) The Talking Coffins of Cryo-City
Eisler-Nelson/October '\$8.95
[For committing a crime against her computerized world, Kallie is sentenced to the strange netherworld of the frozen.]

PAYER, Sue (F) Second Body
Belmont Tower/June '\$1.95
Romantic complications ensue when, in a daring operation, the head of slender young Wendy is transplanted onto the voluptuous body of a girl who died in brain surgery.

PETAJA, Eimi (O) The Stolen Sun
DAW/September '\$1.95
[Kalavala series, No. 2]
Release/2 novels, also contains TRAMONTANE.
SF utilizing themes and characters from Finnish folklore.

PINKWATER, Daniel M. (J) Alan Mendelsohn, The Boy from Mars
Dutton/May '\$8.95
For ages 10 to 13
Weird happenings in Hogboro Junior High, by an outrageous author many will delight in discovering.

PREISS, Byron (F) REAVES, J. Michael
Dragonward
Illustrations by Joseph Zucker
Dragons are in this fall! At least five gaudy non-fiction coffee-table books devoted to the scaly fire-breathers have been scheduled (see the next issue of *Galileo* for details).

REYNOLDS, Mack (F) Lagrange Five
Bantam/October '\$1.95
A mysterious, psychological plague known as The Wide Syndrome (a terrifying form of contagious, claustrophobic madness that can strike anyone at any time) blights the idyllic existence on Langrangia, a utopian space colony.

ROBERTS, Jane (F) The Further Education of Overseas Seven
[Sequel to THE EDUCATION OF OVERSEAS SEVEN]
Prentice-Hall/August '\$8.95
The author of a dozen books of occult metaphysics conveyed from "beyond" by the garrulous spirit, Seth, need to write science fiction ("The Bundu," THE REBELLERS).

ROBERTS, John Maddox (F) Space Angel
Ballantine/del Rey/September '\$1.95
Several years after a devastating interstellar war, Spacer Torwald Raffen recruits a lonely, space-truck orphan on a mission to mine an immense vein of pure diamond on a far-off, primitive world, encountering along the way fantastic alien spaceships, a fifty thousand-year-old alien post and some insectoid art thieves who wish to enslave them.

SABERHAGEN, Fred (C+) The Ultimate Enemy
[Berzerker series]
Ace/September '\$1.95
Saberhagen has become the most prolific author on the Ace lists, with seven new titles published since late 1978.

Empire of the East (O) Ace/October '\$6.95
This is an impressive-looking five-hundred page book described by the publisher as (the author's) "magnum opus" . . . a blend of high technology and high sorcery . . . on a world on the brink of ultimate change, where magic rules and science struggles to live again).

SAXTON, Mark (F) The Two Kingdoms: A Novel of Islandia
[Second of 2 sequels to Austin Tappan Wright's ISLANDIA]
Houghton, Mifflin/August '\$9.95
Not really a fantasy, but a historical romance set in an imaginary country first revealed in a posthumous novel published in 1942.

SCHMIDT, Dennis (F) Kenabo
[sequel to WAYFARER]
Ace/October '\$1.95
The seeming paradise of the planet Kenabo concealed a deadly foe—the Muslin [mental entities that drove men to a killing frenzy and fed off the resulting Madness]. They were held in check by Jerome the Wayfarer and his Zen-like mental discipline. Now, two centuries later, [human greed and lust for power threaten to undo all that Jerome accomplished]. Armies again are marching, for good or ill technology is being rediscovered, men are falling from the Way . . . and the Muslin are waiting still].

SCHULMAN, Neil J. (F) Alongside Night
Crown/September '\$8.95
New York, 1999. [A hotel room costs \$11,500. Fifth Avenue resembles a North African market place, thronged with thieves and degenerates, its goods bartered for with five different kinds of money, its shops protected by hired armed guards]. A projection of present economic trends caused by "a fundamental mistake we make about the necessity of political coercion in organizing human relationships." The author is a young Libertarian, founder of the "Nobody for President" Movement in 1976. "In literary terms," he says, "I am the bastard son of Ayn Rand by Robert A. Heinlein, with C.S. Lewis as favorite uncle and J.D. Salinger as godfather."

SMITH, E.E. "Doc" (F) EKLUND, Gordon
Black Knight of the Iron Sphere
[Lord Feric series, No. 4]
Baronet/September '\$4.95
This series is more space opera than heroic fantasy by now. Tetric joins the crew of his arch-enemy [powerful bionan Pra Villon] with orders to kill him, saving Earth from the devastation of the Matter-Scrambler].

SPINRAD, Norman (F) A World Between
Pocket Books/October '\$2.25
Posted from publication by Jove editor in 1979.

Male chauvinists, Transcendental Scientists, and militant Femocrats contend for the domination of the planetary state of Pacifica, an ideal "electronic democracy" [that produces news and entertainment for the entire galaxy]. Norman Spinrad's first novel since THE IRON DREAM in 1972 should produce lively comment.

STABLEFORD, Brian M. (F) The Parades of the Sets
[Daudelus series, No. 6]
DAW/October '\$1.75
On their final mission, the crew of the contact ship "Daudelus" must resolve the enigma of a planet equipped with a ready-made slave-labor supply (in the affable persons of the manlike Sets). But these beings are as alien to Geb as Man, himself. Who is responsible? Adventures in ethics.

STONE, Andy (F) The Song Kings
Doubleday/September '\$7.95
New author Stone wrote this fantasy with a "new angle" because "there were things I wanted to say about the nature of music to both musician and audience as both entertainment and profound magic."

STRUGATSKY, Arkady & Boris (C) Far Rainbow
Translated from the Russian by Antonina W. Bouis &
The Second Invasion From Mars
Translated from the Russian by Gary Kern
(Best of Soviet SF Series: XI)
Introduction by Theodore Sturgeon.
Macmillan/October/ \$9.95

STURGEON, Theodore (C) The Stars Are the Styx
Dell/October '\$2.25
The first new collection of Sturgeon's short fiction to appear in over five years. Three other books by the author will soon appear from Dell, including THE GOLDEN HELIX, another new collection.

TEVIS, Walter S. (F) Only the Mockingbird
Doubleday/October '\$7.95
The author of THE MAN WHO FELL TO EARTH and THE HUSTLER returns with a love story set in a depressing future New York. The world of 2258 is a controlled society dominated by machines. The populace is drugged from childhood and no one is permitted to read.

THOMAS, D.M. (F) The Flute-Player
Dutton/September '\$8.95
[Winner of the first Gollancz and Pan/Plaidor Fantasy Prize, given in collaboration with The Guardian]. The author is a noted poet, a familiar name

in Moorcock's New Worlds. This seems marginal [a parable of love and art... set in a modern state resembling Russia].

TIEDE, Tom (F) *Welcome To Washington, Mr. Withee-spoon*
Morrow/October/\$9.95

Near future political satire. The statue of a signer of the Declaration of Independence comes to life to save a decadent America from Soviet invasion.

TOLKIEN, J.R.R. (O)(F) *The Hobbit*

& *The Lord of the Rings*
Houghton, Mifflin/October/\$17.95
(paper)
Four-volume boxed set.

VANCE, Jack (F) *Green Magic*

Illustrations by Leila Dowling
Underwood-Miller/May/\$5.00 paper
Pamphlet-size illustrated version of one of Vance's most offbeat short fantasies—for collectors.

VINGE, Joan D. (C) *Eyes of Amber and Other Stories*
NAL/Signed/October/\$1.95

The second collection of shorter fiction by this rising author includes the Hugo-winning title story and, among others, "Media Man," a sequel to which Galileo will publish shortly. Most are longer stories, with room for the development of convincing background detail.

WAGNER, Kari Edward (F) *The Road of Kings*

[Bantam Conan series No. 4]
Bantam/October/\$1.95

Early in Conan's career, he becomes involved with revolution and intrigue.

WATKINS, Leslie
AMBROSE, David
MILES, Christopher
Alternative 3
Avon/July/\$2.25

Supposedly broadcast as a 'speculative' documentary on British TV, this is a wild scenario, in quasi-fictional form, detailing an international conspiracy to prevent the extinction of the human race (atmospheric poisoning due to "the greenhouse effect"). If this isn't a hoax, we have a lot to worry about (and there was a manned expedition to Mars of which you and I were not informed.)

WESTALL, Robert (J) *The Devil on the Road*
Greenwillow/August/\$7.95
For ages 12 and up.

A young cyclist, transported in time back to 1647, becomes involved with Matthew Hopkins, the notorious witch finder.

WHITE, James
Ambulance Ship
[Sector General series]
Ballantine-delRey/October/\$1.95

[Sector General is the most advanced hospital in the universe. Suspended in space between our galaxy and the Greater Magellanic Cloud, administered by Earth and staffed with doctors both human and extraterrestrial, it is furnished with every provision for the special care of patients from every kind of environment. But what happens when the scene of an accident is too far from the hospital?]

Andrew A. Whyte

WILLIAMSON, Jack (F) *The Reign of Wizardry*
Phantasia Press/July/\$15.00
1500 copies of which 175 are boxed, signed & numbered: \$25.00
(1310 Lincoln/Huntington Woods/MI
48070)

ZELAZNY, Roger
Roadmarks
delRey/October/\$8.95

...Time is a superhighway with many exits and entrances, main routes and secondary roads...the maps keep changing...only a few know how to find the access ramps..."

ANTHOLOGIES

ASIMOV, Isaac
GREENBERG, Martin Harry
WAUGH, Charles [editors]
The Thirteen Crimes of Science Fiction
Doubleday/October/\$9.95
[The classic categories of crime fiction...as represented by SF]

ASPRIN, Robert [editor]
Thieves' World
Ace/October/\$1.95
Heroic fantasy concept anthology. All the previously unpublished stories have the same setting, conceived by Asprin. The mythical land of Sanctuary.

BAEN, James [editor]
Destitute Volume One, Number Five
Ace/October/\$2.25

CARR, Terry [editor]
The Best Science Fiction Novellas of the Year #1
Ballantine-delRey/September/\$2.25

DOZOIS, Gardner [editor]
Best Science Fiction Stories of the Year
Eighth Annual Collection
Dutton/August/\$9.95

GRANT, Charles L. [editor]
Nightmares
Playboy Press/September/\$1.95
Mixed bag of terror tales...original and reprint.

HARDING, Lee [editor]
Rooms of Paradise
St. Martin's Press/October/\$8.95
Twelve original stories illustrating the impact of the future on the individual.]

HARTWELL, David [editor]
Destitute Moon
Gregg Press/September/\$15.00
Materials relating to the 1950s film classic, fictional and otherwise.

MALZBERG, Barry N.
PRONZINI, Bill [editors]
Shared Tomorrows: Science Fiction in Collaboration
St. Martin's Press/October/\$10.00

OFFUTT, Andrew J. [editor]
Swords Against Darkness #4
Zebra/September/\$2.25 #4
Heroic fantasy...original stories.

RYAN, Charles C. [editor]
Starry Messenger: The Best of Galileo
St. Martin's Press/October/\$8.95
Please take special note!

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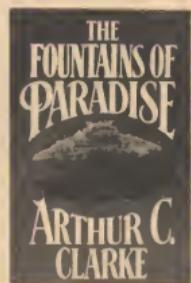
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Reviews

edited by
Floyd Kemske



THE FOUNTAINS OF PARADISE
by Arthur C. Clarke
Harcourt Brace Jovanovich, \$10.00

THE FOUNTAINS OF PARADISE—
EXCERPTS READ BY THE AUTHOR
by Arthur C. Clarke
Caedmon, \$7.98

Reviewed by Floyd Kemske

RESOUNDING WITH at least as many themes as a Baroque organ fugue, *The Fountains of Paradise* describes the attempts of a twenty-first century engineer to build an elevator to the stars. Vannevar Morgan, the man who designed the bridge over the Strait of Gibraltar, reasons that it is possible to lower a cable from a satellite in geosynchronous orbit, providing the basis for a cable car which would make earth orbit accessible without the noisy and increasingly

destructive rocket.

Morgan has decided that the only place on earth suitable for his elevator is at the fortress-temple in Taprobane on the island of Sri Lanka. As one of the book's minor characters remarks, however, there is an irresistible force meeting an immovable object in Taprobane when Morgan begins negotiations with the Buddhist monks who have occupied the temple for several millennia.

There is another novel tucked in this book along with the story of the space elevator, for Clarke provides a fairly complete account of the prehistoric construction of this temple by the Taprobanean tyrant, Kalidasa. The author then interleaves this story with that of Morgan's space elevator in a skillful rendering of the ancient *hubris* theme. The reader is never instructed to make the comparison, but the similarity of the undertakings is too obvious to be missed. Morgan and Kalidasa act somewhat differently (Morgan never puts an artist to death—or chops off his hands—to reduce the availability of his work, for example), but the basic spirit is the same. There is a singular drive to create something which has never been created. There is an esthetic of monumental construction. Both Morgan and Kalidasa are aware of the dangers of their fate-taking ambitions. Both are prepared to pay any price to realize them.

It seems like divine intervention when the island's butterflies manage to fly to the top of the mountain and enter the sanctuary of the temple, fulfilling a three-thousand-year-old prophecy and convincing the Buddhist monks to vacate. But Clarke is just setting the stage for the final removal of God from what has at this point become a variation on the theme of the Tower of Babel. Part way through the subsequent construction of the space elevator, mankind is visited by an alien, semi-sentient, interstellar probe, which answers questions about the universe, other lifeforms, and God. This novel has started off as a study in *hubris*, but the probe (filling the role of a Chorus) turns this classical theme around. "Belief in God," it explains to stunned humanity, "is apparently a psychological artifact of mammalian reproduction." The implication, of course, is that there is no God to prevent man from building his Tower of Babel.

Clarke has written a tragedy, however, and it must come to terms with an unstated question. If there is no divine retribution for godly ambitions, is there any control of them at all? Apparently there is, because everybody in *The Fountains of Paradise* who conceives a godlike undertaking has to pay the price. In the end, however, the two builders succeed: the temple at Taprobane is erected, the space elevator is completed. Man can do anything, given an individual

courageous enough (or crazy enough) to play God. The vision is undeniably positive. As a simple adventure, it is a good book. As an examination of humanity's horizons, it is an outstanding one.

For those who prefer to listen to their science fiction (or for those who missed the Apollo 11 commentaries and would like to hear Arthur C. Clarke's voice), Caedmon has issued a recording of the author reading excerpts from *The Fountains of Paradise*. I am glad I had the presence of mind to listen to the record before I read the book. The record is a complete story by itself (even without having read the book, you won't have any trouble filling in the minor gaps between the excerpts), but it verges on being a different story.

The record's approach is just as positive as the book's, even while dealing out the same tragedies. In omitting all the material about the interstellar probe, however, it must treat the Tower of Babel theme differently. There is nobody here to come onstage and tell us that God does not exist. The excerpted story, therefore, seems much more classical. It is no less a complete story, just different.

Clarke obviously has great feeling for this novel (the book has a six-page appendix in which he muses on his responsibilities as the author as well as describing the authenticity of the story's concepts and background). While he reads it with admirable restraint, the feeling does come through, lending the recorded version an unexpected excitement, whether or not the author's surprisingly nonresonant voice could pass for professional. Caedmon has obviously invested a great deal of effort in this record. They apparently took all the recording equipment out to Sri Lanka, where Arthur C. Clarke lives (and doesn't like to leave) and managed to release the finished record virtually simultaneously with the publication of the book. This strikes me as no mean feat and indicative of the company's ambitions to make author readings widely available and timely.

THE PRINCESS OF ALL LANDS
by Russell Kirk
Arkham House, \$8.95

Reviewed by David Johns



RKHAM HOUSE was founded in 1939 by August Derleth and Donald Wandrei to preserve the writings of H.P. Lovecraft in hardback. Through the years the firm built a reputation as the quality publisher of the weird story, horror tale, and similar genres. Booms have risen and burst, but AH seemed to go on forever until approximately ten years

The hard stuff is better.

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6. *Make Us Happy*, Herzog
7. *The Best Short Stories of J.G. Ballard*
8. *2001: A Space Odyssey*, Clarke
9. *The Stand*, King
10. *Red Shadows*, Howard (art: Jones) [o.p.]
11. *Red Moon and Black Mountain*, Chant
12. *The Book of Skulls*, Silverberg
13. *The Masters of Solitude*, Kaye & Godwin
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18. *Creep, Shadow*, Norton, ed.
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21. *New Constellations*, Disch & Naylor, ed.
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25. *World Out of Time*, Niven
26. *The Annoute of From the Earth to the Moon*, Verne (Illust'd)
27. *The Magicians*, Gunn

NON-FICTION

- 28. *Artist and Computer*, Levitt, ed. (Illustr'd)
- 29. *The Making of King Kong*, Goldner/Turner
- 30. *The International Science Fiction Yearbook 1979*
- 31. *In Memory Yet Green*, Asimov
- 32. *The Best of Byte*, I. Ahl/Helmers, ed. (Illustr'd)
- 33. *Mechanisms*, Harrison (Illustr'd)
- 34. *SF: An Illustrated History*, Lundwall
- 35. *Alien Creatures, Siegel/Swarcz* (Illustr'd)
- 36. *The Jewel-Hinged Jaw*, Delany
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- 38. *Illustrated Checklist to Underground Comix*
- 39. *The Way the Future Was*, Pohl
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43. *Home from the Shore*, Dickson (art: Odber)

44. *Dork Imaginings*, Boyer/Zahorski, ed.

45. *The Illustrated Dune*, Herbert (art: Schoenherr)

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ago when Derleth died. Ever since then the health and quality of AH has been a subject of concern to collectors.

Part of AH's appeal has been the uniformity and smallness of its editions. Rarely have more than 5,000 copies of a book been printed (in most cases less), and for years uncounted the same kind of binding, paper, and type style were used. In recent times there have been changes; the quality of the interior paper has improved. The pages are brighter, more substantial to the hand; and more likely to last. Books of the past several years have had more and more interior illustration as well as indications of actual design; volumes have individual personalities rather than the older sameness from one title to the next. Overall, most of the change is for the better, except for one glaring flaw. Some of the most recent titles have omitted any indication of the number of copies printed. To the serious collector of AH this is a mortal sin producing an element of uncertainty that is neither welcomed nor appreciated.

It should be rectified without fail in the future.



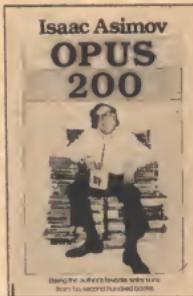
Russell Kirk hardly needs introduction to connoisseurs of the weird or horror story. While his output is relatively small, its quality is high, as this collection of older and more recent tales amply demonstrates. His settings, whether the backwoods South or the grimy industrial towns of north England and Scotland, reek with a miasma of decay and corruption. The first sentence of the very first story, "Sorworth Place", convinces you that it is not a pleasant place to be: "In defiance of a faint ancient charm that perfumes its name, Sorworth today is a dirty and dreary little town, fouled by the colliery since the pit was sunk and a blot of hideous industrial workers' houses began to spread about it."

Similarly, the lurking shapes in the shadows will convince a reader never to stray off the mainpath into the forgotten and neglected corners of the world, and anyone who does deserves what he gets.

Indeed, justice is the one thing that

stands out in most of Kirk's stories. Little old ladies, young girls, and weary, careworn travelers have nothing to fear from Kirk's boogymen. It's the officious census taker of "Behind the Stumps," the cold-hearted urban planner of "Ex Tenebris," or the scheming thief of "Balgrummo's Hell" who should look out, and generally don't.

You, gentle reader, will finish this book having sipped tea with a kindly pensioner and been regaled by an *eminent grise* of an African republic, among others. If you're very lucky, your soul may be saved at "Saviourgate," but at least you'll have enjoyed your stay and look forward to Kirk's next visit (which will be in a novel this fall from St. Martin's).



OPUS 200
by Isaac Asimov
Houghton Mifflin, \$10.95

Reviewed by Marshall Tamm

IN MARCH, 1979, Doubleday released *In Memory Yet Green: The Autobiography of Isaac Asimov, 1920-1954*, which promises to be a major event for Asimov fans. Simultaneously, Houghton Mifflin released Asimov's *Opus 200* in commemoration of his 200th book. Only Isaac Asimov could have accomplished the seemingly impossible feat of publishing one's 200th book twice. As to which title is the "official" 200th, I leave that to Professor Marjorie Miller, who may someday update her Kent State University Press volume, *Isaac Asimov: A Checklist of Works Published in the United States, March 1939-May 1972*.

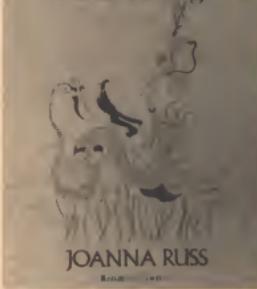
For his *Opus 100*, which Houghton Mifflin published in 1969, Asimov "took passages from [his] first hundred books and carefully divided them into categories." In *Opus 200* Asimov employs the same organizing principle, with selections from his second hundred books divided into categories such as astronomy, robots, biology, words, history, humor, literature, mysteries,

autobiography. Within each category are selections from Asimov's fiction and non-fiction. For example, the chapter on "Astronomy" contains passages from *The Gods Themselves* (1972), *ABC's of Space* (1969), *Did We Find Out About Comets* (1975), *Comets and Meteors* (1973), *Alpha Centauri, the Nearest Star* (1976), and *The Collapsing Universe* (1977).

Asimov has provided a useful bibliography of his second hundred books as an appendix; the titles are arranged by year of publication, and alphabetically by title within each year. It is interesting to note that both *Opus 200* and *In Memory Yet Green* are listed as 200th, with *Opus 200* listed first. The reader can draw his own conclusions from this data which Asimov provides.

Opus 200 is a delightful collection of passages from works published since 1969 which provides us with a glimpse of Asimov's remarkable diversity of subject matter. Its chief value will be as a collector's item for Asimov completists as well as librarians acquiring core collections of the major science fiction authors.

KITTATINNY A Tale of Magic



KITTATINNY, A TALE OF MAGIC
by Joanna Russ
illustrated by Loretta Li
Daughters Publishing Company, \$5.00

Reviewed by Lisa Tuttle

TWO PEOPLE read *Kittatinny* when I sat down with it: the adult I am and the child I was. The best children's books are the ones we can read with pleasure at more than one age.

The story is a good one, full of marvellous adventures. It's about what befalls young Kittatinny Blue-eyes (called Kit) when she inadvertently runs away from her home in the dull, peaceful

[Continued on page 95]

Reviews

Cover Your Bets

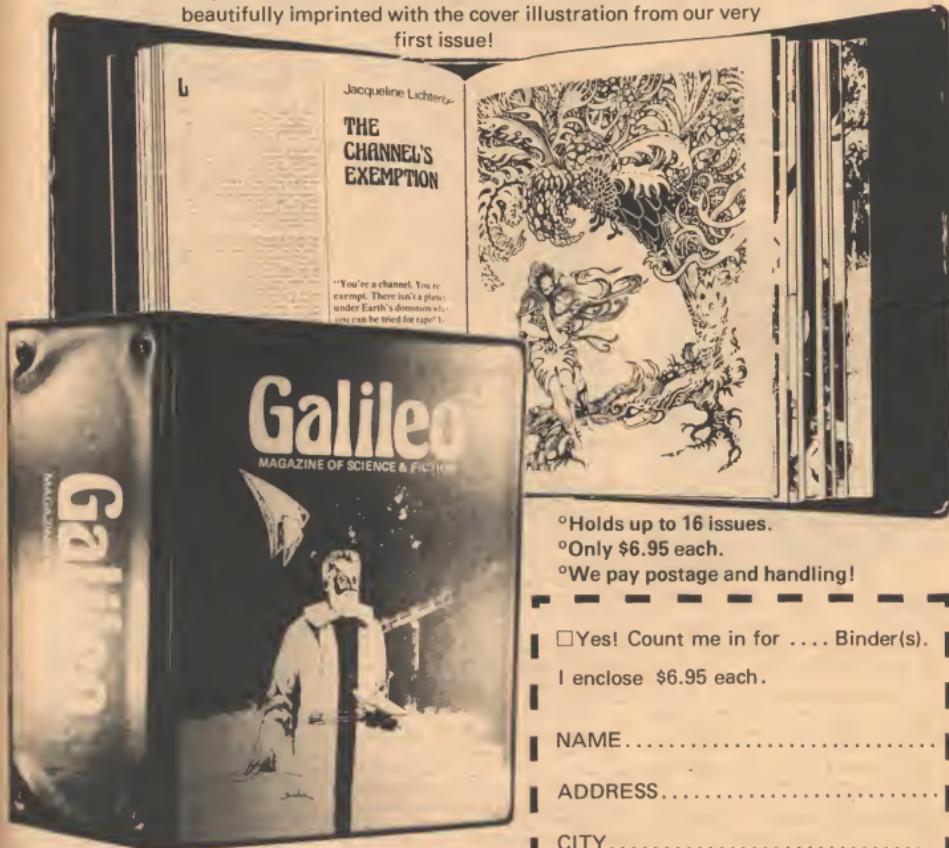
Some people are betting Galileo is going to be around for awhile. We have so few copies left of our first four issues that we've had to raise prices repeatedly to discourage all but the most serious collectors.

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Games

Marvin Kaye

ASTRO WAR
Educational Design Inc.

COSMOS
Nick-Glennie Enterprises

FORCE
Invicta

OGRE; G.E.V.
Metagaming

STRANGE NEW WORLDS
Gametime Games

TAC-TICKEL
WFF 'N Proof

COMBAT, WHETHER in the guise of personal competition or full-fledged war, is an inescapable metaphor of gaming. The very nature of any game is confrontation, even if one of the opponents is a computer. A game enables one to flex physical and/or mental muscles, pit wits, or merely (as in such old favorites as *Bingo* or *Yahtzee*) trust to luck, with the goal of victory for one's own side.

It is no accident, then, that many people are not fond of games-playing. It is an activity that puts the ego rather uncomfortably on the line. In fact, an Avalon Hill executive once told me the surprising news that one of his most popular products was a battle simulation game in which one player has 90% likelihood of winning. I expressed surprise, but he explained that the loser forfeits no face when the odds are that overwhelming... yet if he *should* win, he's a goddam military genius!

This month's products all embody aspects of warfare, some on a cosmic level. Each has its own luck/skill index, with the greatest number leaning towards the latter pole.

From Metagaming comes an unusual idea in gaming: the futuristic battle game *OGRE* and its sequel (yes, Tolkienism has even penetrated the game field), *G.E.V.*

Both games hew to a popular wargaming mode: that of a battle terrain divided into many modules over which numerous tactical weapons may fight in rigidly structured patterns. Battle results almost always depend on skillful deployment of fire power together with dice-throw-determined variables.

I've seen many games of this type, most of them reconstructions of famous historic campaigns. They tend only to be as interesting as one's personal concern with that sliver of world history. The game structure—modules, weapon deployment, dice-directed battle results—grows wearisome to all but the most rabid wargaming buff.

Metagaming, however, has come to us with a happy twist on the theme by projecting its products into extraordinarily imaginative future societies, with the necessary technological research carefully and interestingly executed.

OGRE and *G.E.V.* are placed in the same world-set: Twenty-first Century mechanized combat, in which even a soldier is a formidable armored weapon. The Ogre itself is reminiscent of Mike Moorcock's land leviathans: fully-automated "cybertanks" with a horrifying mammoth assortment of missiles and other weaponry, all of which may fire in a single turn. In the basic *OGRE* scenario, a single Ogre invades enemy territory that is defended by a great array of howitzers, missile tanks, infantry and other ordnance—yet the two players are more than evenly matched; if anything, the Ogre unit has the advantage of flexibility and quick getaway.

G.E.V., named after a light rapid "ground effect vehicle," also featured in *OGRE*, offers a new terrain that includes a town and a railroad for simulation of supply maneuvers. A larger, even more frightening Ogre tank may be used in this follow-up game.

Both these games are inexpensive and chiefly consist of paper maps ("playing boards") and cardboard counters that, while small, are acceptable, considering the attractive pricing that puts *OGRE* and *G.E.V.* practically in the impulse-sale category. Both may be played by two, or teams of players—and are also fascinating solitaire contests.

Each Metagaming kit (including paper game map, cardboard weapon/pieces and rule book) is small enough to be displayed on a single peg at any retail outlet. Other items in the firm's line will be reviewed in the future, and I would like to recommend, as well, the firm's *Sticks and Stones*. Though not strictly SF, it cleverly adapts the module/wargame principle to a Stone Age river-valley setting. (Conan freaks take note).

Metagaming publishes an ancillary

magazine, *The Space Gamer*, which includes reader-suggested variations on the marketed titles in the line. This strikes me the same way as authors who never know when to quit writing sequels. (I should talk!) But wild-eyed game buffs will probably want the magazine, too.

If Metagaming makes some of the smallest SF games, the new firm, Nick-Glennie Enterprises, probably makes the largest: *Cosmos*.



A battle in our solar system among colorful rocket ships (gold tees topped with plastic "doughnuts"). *Cosmos* comes with an over-sized, handsome playing board, the "ships" and "doughnuts," rule book and special charts and cards to shape the progress of battle in space.

The players each take a planet as home base and begin with five "rockets" whose surmounting "doughnuts" color-key the mobility of each rocket. To win, one must eliminate the enemy's rockets—all of them—in battles largely dictated by luck of the draw. Each time a rocket is successfully fired on, the attacking rocket "graduates" to a higher-rated bead in top, and its mobility increases. Players may also win by landing a rocket on an opponent's home-base planet, a pattern strongly reminiscent of Chinese Checkers.

Though battle is determined by sheer luck, each player is afforded a lot of leeway in moving each ship, deciding whether to fire or "sneak attack" on home planets, and (in games with many players) whether or not to make alliances against common enemies, i.e., players who are way ahead. *Cosmos* may be played by two or up to eight, and becomes a faster, more challenging game when more people participate. It is one of the most attractive games I've ever seen offered by a new firm, which, after all, must operate on a smaller budget than Parker Brothers. If Nick-Glennie can keep up their attention for detail, play value and tasteful design in new products, they ought to do well.

Recommended—but don't drop the 23½ x 25-inch playing board on your foot.

Interplanetary battle is not a major aspect of the scenario of *Strange New Worlds*, but it may well prove the tactic which wins the game. This product from the Gametime division of Heritage

[Continued on page 91]

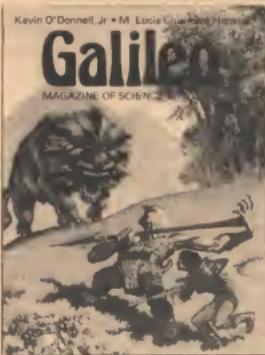


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2020...

Marvin Kaye



SOMEDAY—IF I can find a publisher dumb enough to pay hard cash for it—I'd like to write a book called "Flops I've Loved, Hits I've Hated!" Amongst the latter I'd include *Man of La Mancha*, *The Godfather*, *Rosemary's Baby*, *The Exorcist*, Mike Nichols's *Who's Afraid of Virginia Woolf?* (note: not Edward Albee's), and everything ever directed by Robert Altman. Amongst the former there'd be such neglected masterpieces as Bob Shiarella's Swiftian satiric novel, *Your Sparkle Cavalcade of Death* and Henry Jaglom's agonizingly lovely film, *A Safe Place*.

With this *caveat* in mind, let me confess that I absolutely adore the ABC-TV/Columbia weekly series, *Salvage-1*.

I have read the critics who call the show implausible and agree that there are more than a few things that stretch the suspension of disbelief, and yes, I have heard that hackneyed remark that "once you go to the moon, where else is there?" (except I do *not* accept that one as other than a cheap shot).

The fact (my fact, anyway) is that *Salvage-1* has hit upon a highly entertaining formula for a weekly adventure series: pitting a comparatively small American businessman against all the monolithic powers that be (usually represented in the fine portrayal by Richard Jaeckel of a harassed but intelligent and—yes—quite sympathetic FBI agent), and seeing that the "little guy" comes out on top.

Now this is the kind of thing that Frank Capra captured in 1940s films and which Bob Heinlein did gloriously in the 1950s: you know, the quint-essentially American buoyant adventure in which any right-minded teenager can go to the Moon with a few bales of chickenwire, a high school physics text, and tons of hoosier determination.

Salvage-1 is reminiscent of the '50s juvenile Heinlein, but this is far from a put-down. The fact is, most SF in the mass media is rehashed Buck Rogers from the '20s and '30s. If one show has graduated to being merely twenty years behind the times, I say *hurrah!* (and without the least bit of sarcasm).

Salvage-1 is a joint production of Columbia Pictures Television and the team of Harve Bennett and Harris Katieiman. The creator of the initial concept—and supervising producer—is the amiable former engineer, Mike Lloyd Ross, who became obsessed, several years ago, with the idea of a TV or theatrical film in which a civilian decides to build a rocket capable of flying to the moon for the purpose of salvaging all the spacejunk lying there.

The idea eventually became the pilot episode for *Salvage-1*, a made-for-TV movie in which junkman Harry Broderick enlists the talents of former astronaut Skip Carmichael and munitions/fuel expert Melanie Slozar to send an unauthorized flight to the moon for salvage purposes. On the way, Melanie utilizes a highly-explosive fictional propellant, mono-hydrozine, and she and Skip have several near-fatal mishaps en route to and from earth's satellite.

A good deal of the success of the series, in my opinion, is due to the ensemble performances by the leading actors: Andy Griffith (in a welcome departure from his usual hayseed type-casting) as the irrepressible Harry; Joel Higgins as the slightly-reckless-but-enormously-competent Skip, and Trish Stewart in a laudable role as a thoroughly competent woman who in no way needs to compromise her femininity to hold her own in a stereotypical masculine profession. Ultimately, though, the credit rests with Mike Lloyd Ross for creating three enormously

likeable characters who possess senses of humor and greatly respect and care for one another. (How refreshing to see simple friendship so supported on the tube! Wouldn't it have been nice, just once, to see Phelps bestow a "Good job!" on Cinnamon at the end of an IMF adventure instead of those equivocal and cold smiles that we were always frustrated by?)

Not all *Salvage-1* shows are science fictional, but many were in the initial season, and all in all, these were the most satisfying: plots like the salvaging of a pure-gold communications satellite in orbit and the incidental rescue of a NASA mission—a two-part episode which was quite as thrilling and suspenseful as the moonshot pilot; the temporary but promising solution by Melanie of the country's energy crisis; the giving of sanctuary to a reluctant android soldier, and, in a surprise twist, the aid of an alien who needs the team's expertise to "beam" him back to his home-planet. (The latter was surprising because the show, for the first half, *seemed* to be a gothicky haunted house story, until it was learned that the alien was responsible for all the "para-normal" occurrences.)

There have been occasional improbabilities, especially the scene in which the aforesaid alien, back on his home planet, somehow manages to molecularly restore all the property damage he wrought early in the episode. On the other hand, one bit of razzle-dazzle I suspected on the pilot episode—in which Skip claims they can break out of earth's atmosphere by slow, steady acceleration instead of the more usual step-rocket system—turns out to be rooted in fact. (That's what ex-engineer writer-producer Ross asserts, and I must bow to his superior technological knowledge.)

Anyway, whether or not every detail is scientifically plausible is beside the point. This has been a dead-horse issue for decades in SF, and has nothing much to do with meaningful writing. (Consult the old pulps and note the number of outraged reader letters damning the works of Bradbury, particularly his magnificently poignant tale, "Kaleidoscope," of which it was pointed out that dying men in space really can't talk in a vacuum. But when the human truths expressed are *that poetic, who cares?*)

The relevant thing to remember about *Salvage-1* is that it's good-natured, has a sense of humor, and pays more than lip-service to both human dignity and that cliché we old boys still believe in, American ingenuity. It also has three excellent actors in the leads, including Ms. Stewart (whom I confess to admiring inordinately, but plead it not to be a case of chauvinism, but simply inescapable male libido).

In the final analysis, I love *Salvage-1*, because, like that old radio warhorse, *I Love A Mystery*, it is just plain fun.—G.

Games

[Continued from page 88]

Models allows from two to six players to "explore" new worlds and try to colonize them, i.e., to pay a bank the requisite fee for "opening" that world. (For example, one may land on a world without air. To colonize it, one must have in one's hand, or be able to purchase, a Science Officer "crew" card, as well as 50 credits in cosmic currency.)

The player who colonizes seven worlds first is the winner, but opponents may attempt to conquer enemy worlds with crew cards that bear greater numerical value than the cards resting on the world under attack.

Perhaps the most unusual aspect of *Strange New Worlds* is a condition which mimetically makes the resources of one's colonies scarce. In other words, once one colonizes a world and leaves it, that world will continue to produce income and may harbor valuable crew card "citizens"—but none are available to the home planet until the rocket ship is diverted from new colonization (as one must do when credits run low) and sent back—sometimes across long distances of space—to collect one's colonial taxes and personnel.

Strange New Worlds allows players to move slowly or swiftly by limited hyperspace destination, including undesirable black holes. There is considerable opportunity for skillful play and a fair amount of luck, too. The game pieces, though mostly cardboard, are attractively designed.

On the negative side, the instructions are too brief and fail to detail all the circumstances that may occur in a game. Also, the contest goes on rather too long when it is played by few; it is much more

lively when the maximum half-dozen competitors vie for Empire.

The successful Mini-Lab series from Educational Designs Inc. branches into SF this month with a clever new activity kit/game designed by the authoritative children's author, Steve Caney. *Astro War* is both a science project and a series of a half-dozen tactical games for two players or two teams.



Essentially, *Astro War* consists of a battery-powered transistorized game board sensitive to pressure. Various programmable sheets may be marked with soft graphite pencilings and covered by any of six game maps. Players take turns moving along the maps, but if they land on a module beneath which a mark rests, a tell-tale LED will go on. This principle allows one to play in maze-type competitions, as well as Salvo-like interstellar battles.

The games themselves range from ho-hum, luck-only activities to reasonably challenging enemy spaceship battles. But the real fascination of *Astro War* is that it comes in kit form and must be assembled, step by step. It makes a wonderful present for a science-minded eight-year-old. Requires a 9-volt battery, not included.

Battle on a cosmic level is also the theme of *Invicta's Force*, but the actual play is more abstract than the simulative scenarios of *OGRE* or *Cosmos*. On an attractive plastic playing board is placed a series of white pegs resembling golf tees. The pegs are stuck into any number of holes bearing various stellar-body designs: moons, suns, stars, planets.

Two players sit on opposite sides and stretch elastic "warp" bands from pole to pole of the board. One set of bands is red, the other white. Because of the many pegs in the board, the bands zigzag all over the playing surface. The object of the game is to carefully remove pegs so as to eventually free one's elastic bands from touching any pegs, simultaneously entangling those of the other player. First one to get his bands totally unencumbered wins.

Force depends entirely on skill, is easy to learn and hard to play well. An average game lasts perhaps ten minutes. It meets all the criteria of the hypothetical good mass-market game, and is worth purchasing for a new and pleasant way to pass a few odd moments.

Best Sellers

Compiled as of August 1, 1979

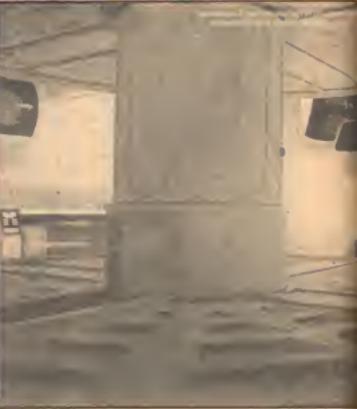
HARDCOVER

1. *Harpist in the Wind*
Patricia McKillip/Argo
2. *Dragonrums*
Anne McCaffrey/Argo &
Jem
Frederick Pohl/St. Martin's
3. *Titan*
John Varley/Berkley Putnam
4. *The Language of the Night*
Ursula LeGuin/Berkley Putnam
5. *On Wings of Song*
Thomas Disch/St. Martin's

PAPERBACKS

1. *Alien*
Alan Dean Foster/Warner
2. *Dreamscape*
Vonda McIntyre/Dell
3. *Castle Roogna*
Piers Anthony/Ballantine
4. *Strange Wine*
Harlan Ellison/Warner &
The White Dragon
Anne McCaffrey/delRey
5. *Fires of Azeroth*
C.J. Cherryh/DAW

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Entertainment

David Gerrold

IT'S WHEN science fiction bumps up against the rest of the world that some fascinating developments—mutations?—occur. Some of the resulting offspring (computer-played SF games, for instance, and role-playing simulations) are healthy young hybrids—boyoy, what a glorious future awaits us all! Others, unfortunately, seem to be defective children—excellent arguments against prolonged in-breeding.

Let's talk about film:

In 1968, Stanley Kubrick's *2001: A Space Odyssey* was released. It began with a group of apes entranced by an enigmatic object and it ended by becoming an enigmatic object itself to equally entranced descendants of those apes who sat in awe before a giant Cinerama screen. And if the story sometimes confused the viewer, there was always all that luscious hardware to wallow in. *2001* established a standard of excellence in science fiction production values and special effects that all subsequent films have had to match or surpass if they were to achieve audience acceptance. Anything less than that is simply not believable enough, because we've seen better.

As such, Kubrick's imagery is the

thematic ancestor of today's "hardware" science fiction.

Star Wars, of course, is the definitive "hardware" film. It is a lot of other things as well, but it is the hardware of the film that is most easily imitable—and most often imitated, as we have seen in Universal's late (but unlamented) *Battlestar Galactica*, not to mention the upcoming *Buck Rogers* television series. (Don't get your hopes up that it will be worthy of serious attention; from all indications, it looks like it's going to be just so much more junk food for the eyes.)

Like *2001* before it, *Star Wars* raised the standard of production values for SF film, and in doing so, established "hardware science fiction" as a category all its own.

In the film industry, imitation is the sincerest form of plagiarism. A few years back we had the "disaster films" (and many of them indeed were disasters); the success of *Star Wars* has created a whole new cycle—not a science fiction cycle so much as it is a "hardware" cycle.

The most recent example of this is *Alien*.

Alien is a taut, well-made thriller. It's been cut a bit—to help pacing and to tone down the gore—and the result is that some of the details of the creature's

behavior are lost, but no matter; *Alien* will still probably establish itself as a classic, despite the inevitable picked nits. It is a frightening film, and perhaps the first of a whole new subcategory: "Space-Gothic." (On a scale of 10, it's easily worth a 9.)

However, getting beyond those assessments, the film occasionally leaves some members of the audience puzzled. The ones who are not science fiction fans, who do not have their basic science fiction vocabulary, come out of the theatre wondering just what happened. Oh, they were scared all right, they just didn't understand the details of what was going on. There was too much hardware for them to assimilate. It overwhelmed them.

In one sense, those people have been left behind by the times. The future is rushing down on all of us faster than we dare to admit and the films of the eighties—particularly those made by the newest generation of filmmakers—are likely to be as uncompromising as *Alien*, and equally incomprehensible to those who cannot keep up.

The hardware is not a trend in itself; it's a symptom. If anything, the hardware in science fiction films is beginning to reach a point of diminishing returns. Hardware alone cannot sell a film—there has to be a good story to justify the gadgetry.

It's in the proliferation of hardware for its own sake that the real hero of the story—the *idea*—is obscured. Hardware can create a context for a story, but it can't stand in for the integrity of thought and concept that science fiction demands. If the thought isn't there, then the piece is just so much "sci-fi."

I give you the concept of "hard-sell" science fiction.

Think about blueprints and fotonovels and calendars. Books of pre-production artwork and hack-novelizations and plas-



tic games. Cereal premiums and comic books and TV specials and how it was made. T-shirts and action-figures and model kits and every other kind of merchandising gimmick imaginable. Soundtrack albums and disco versions and electric moog copies. Bedsheets and wallpaper and poster-books and watches.

As much money will be spent on advertising a hot film as was spent to make it in the first place.

Part of it is that a film is a multi-million dollar investment, and advertising is part of that investment: letting the audience know that this movie exists. Merchandising is also part of the investment. But sometimes...sometimes, the film that was the reason for it all stops being a film and becomes instead just another property.

We have seen the hard-sell applied to *Star Wars* and *Superman* and *Alien*. At least in those cases, there was a film under all the flackery.

We have also seen the hard-sell applied to lesser products—think about *Battlestar Galactica*, the most aggressively hyped television program in the history of the medium, cancelled at the end of its first season—proving joyfully that you can't fool them all the time.

Hard-sell science fiction is a fact of life. It will be with us for as long as *Star Wars* and *Star Trek* are spawning sequels and imitations.

Or at least until the next unusual film catches the public fancy and starts a whole new trend.

But until then, brace yourself, because coming at us in the not too distant future are *The Empire Strikes Back* and *Star Trek—The Movie* and *Black Hole* and all the lamentable copies.

If you think you've seen hard-sell science fiction, you'd better strap yourself in, kids, because we're about to enter hyper-space.

—G—

PUBLISHERS SEND me a lot of science fiction books. I can't read them all, or even a significant fraction of the ones I get, but I do try to glance at the new ones, at least. A few months back, one of the ones I glanced at was a Berkley paperback called *The Pleasure Tube*, by a writer new to me, Robert Onopa.

This isn't a book review. I haven't read *The Pleasure Tube* and I suspect that I probably never will, although—on the basis of a quick thumb-flip—it looks like a lively and inventive novel. The reason I mention it here is that on the same quick thumb-flip I encountered a character named "Werhner" and another named "Collette."

Notice where the *h* is in "Werhner." It's not quite where Wernher von Braun wore it. It has wandered over one place, which isn't very far, but just far enough to create a combination of consonants—*rhn*—that looks almost right except to somebody who knows how the German word "Werhner" is spelled. If the author had transposed letters in the other direction, to make the name "Wehrner," that might at least have sounded plausibly Teutonic. "Werhner" just sounds ignorant—the way "Smith" or "Joanes" would in a novel by a German.

As for "Collette," that's a nice French-sounding female name, and for all I know it's a legitimate one. But all the Colettes I can think of spelled their names with a single *l*—from St. Colette of the fourteenth century on down to the twentieth-century French novelist, who was, I suspect, the person in Robert Onopa's mind when he chose his character's name.

Okay, you say, I'm being picky. What does it matter whether "Collette" is spelled with one *l* or two, anyway? And "Werhner" sounds exactly like "Werhner" to the American ear, so where's the harm? What counts is the *story*, right? Who gives a damn how the author chooses to spell his own characters' names? For all we know, "Collette" and "Werhner" may very well be spelled just that way before long.

I yield on the last point. Words are becoming separated from their underlying roots so rapidly that spelling seems purely arbitrary to most people, and in a world where spelling is arbitrary, anything goes. But words—and names are words—are spelled arbitrarily only in the decadence of a language, when communication is breaking down. The reason we insist fastidiously on correct spelling is that, for those of us who understand the language of words, words contain signals explaining their own meanings and leading to other meanings. Once you've forgotten that the word *millen-*

Opinion

Robert Silverberg

nium contains the Latin *annus*, you don't have any reason not to spell it "millenium," and might get indignant at being corrected. But by knowing the root, I have a way of knowing that "millenium" literally means "a thousand years," and that leads me to all sorts of useful associations—knowing, for example, why the people of A.D. 999 got so tense as the "millenium" approached.

So it won't do to shrug and say that in the coming illiterate age we can forget about spelling accurately. "Werhner" may turn into "Werhner," but in that process we're going to lose a lot of valuable data. And Robert Onopa wrote his book in our own time—when the names he used still had fixed structures.

There's a legal phrase, *Falsus in uno, falsus in omnibus*, that every writer ought to keep in mind. It means, "False in one thing, false in everything." A harsh position, but writing is a harsh business. When I see a writer bungling the spelling of a name, I wonder inevitably whether he's bungled his geography, too, his chemistry and physics, his history, and everything else. I don't think Robert Onopa did that—his book looks intelligent and informed, and he may merely be a lousy speller who writes well in all other respects. (Cf. Samuel R. Delany, who is notorious among editors for his foul spelling, and who immortalized that trait by misspelling the ancient and honorable name of "Dahlgren" in his own best-known novel.)

But *Falsus in uno, falsus in omnibus*: the fumbled details, no matter how petty, generates mistrust among readers. Where was the copy-editor when Onopa's "Werhner" slipped through? Copy-editors are supposed to catch stuff [Continued on page 95]

Inquisition

Letters



TO THE EDITOR,

In your article "NASA Notes" published in the July, 1979 issue of *Galileo*, you report the results of a "recent government analysis on the economic benefits of satellite weather imagery." Since the government agency responsible for the analysis is not mentioned and all other information in the article is NASA related, the article leaves the reader with the impression that the report is a NASA product. Actually the cost/benefit analysis was done by the National Oceanic and Atmospheric Administration's (NOAA) National Environmental Satellite Service (NESS). NESS is the federal agency responsible for the United States' operational environmental satellite program. NASA and NESS work closely with each other, but for the benefit of your readers seeking further information on the economic benefits presented in your article it would be useful to explicitly distinguish the two.

Michael Matson

Environmental Sciences Group
Washington, D.C.

"The Economic Benefits of Environmental Satellites" is a paper presented by W. John Hussey and E. Larry Heacock to the Eastern Economic Association in April, 1978.

—Ed.

Dear *Galileo* People,

David A. Truesdale, in a book review in the July issue, states that "Donald A. Wollheim has long been known for publishing the first works of now-famous authors—Samuel R. Delany, Marion Zimmer Bradley, and Ursula LeGuin just to name three."

Actually, LeGuin's first published work appeared in the September, 1962, *Fantastic* and Bradley's in a 1953 issue of *Vortex*: four years and eight years,

respectively, before their first sales to Wollheim. Wollheim did publish Delany's first of sale, in 1962, but his first professional work—an article in *Seventeen*—beat Wollheim's by several months. Other than that, fine.

Dennis Lien
Minneapolis, MN

Dear Mr. Ryan,

I enjoyed Connie Willis's story, "Homing Pigeon," though I'm not sure whether it was in spite of or because of the disjointed pattern in which it was presented. However, I did find one *minor* (my stress is intended) flaw.

Ms. Willis should look at a game of Candyland. My daughter has one, so I'm sure of the following point. There is a Molasses Swamp. There is not a Molasses Swamp card. It doesn't actually affect the story, but factual side points should be just that, shouldn't they?

Avi Ornstein
New Britain, CT

Dear Mr. Ryan,

Of course there is no such Stapledon title as *First and Last Men* as per Amicus J. Steinway's letter in the July issue. I assumed this was a typo when I read it. There is also no such Stapledon title as *Last and First Men in London*. The proper title is simply *Last Men in London*.

Arthur W. Saha
Cooperstown, NY

Dear Mr. Ryan,

I have noticed a curious irony in science fiction: in a field usually so progressive in its application of science to the future, it is often puzzlingly obsolete when it comes to the business of human relations. I write this letter to commend your magazine for its firm prodding of NASA ("NASA Notes"—Issue #13) regarding its paternalistic and discriminatory policies toward training women astronauts for the Space Program. Experiments that compare male and female responses to the rigors of space surely have merit, but can accurate conclusions be drawn from such limited artificial experimentation and minuscule population samples? Whether indeed women are capable of enduring the stress of space flight will only be determined when they are given the same opportunities as men to prove it.

Elizabeth Woodville
New York, NY

Dear Charles,

Just finished #13 and continue to be pleased with the increased quality and success of *Galileo*. I was bugged by one thing, however, and thought I'd pass it along so that the error may be avoided in the future. In her "Homing Pigeon" (a gem with rough spots), Connie Willis casually associates parapsychological re-

search with Duke University. While this is an all too common thing (a Hollywood hack did the same thing on a TV show last week), no such association has existed for over 18 years. I'm sure that you wouldn't let a writer get away with a statement about a Dept. of Astrology at MIT, and I feel that the time is well nigh to end such misstatements about my graduate alma mater. Sure, if humor is intended, anything goes, but all too often a writer really assumes that Duke still practices witchcraft.

For the record, along about 1962, Dr. J.B. Rhine was asked (some would say forced) to sever all ties with the University, chiefly because the Dept. of Psychology simply couldn't stand the association any longer. The Drs. J.B. and Louis Rhine had, after all, all their formal training in and degrees in Botany! The Rhines then established, with private funding, the Foundation for Research into the Nature of Man, literally on the fringe of the Duke campus. About five years later, a splinter group which included one of the most delightful conmen "mediums" I have ever met broke with the Rhines and established their own Psychical research Foundation off another odd corner of the Duke campus. As far as I know, both groups still exist today and continue to bring wince to the faculty of the Duke Psychology Dept.

Ms. Willis may be amused to know that Rhine & Pratt did extensive research on the question of ESP in homing pigeon navigation—with less success than Ms. Willis's heroine.

Dean R. Lambe
Vincent, OH

Spirit

[Continued from page 18]

material particles exist, but its awareness and influence could extend not only through the space around us, but could also extend into the time around us. Conceptually, this could be all the way to eternity, so that in this view, the spirit would be immortal. However, as in the case of space-curvature, I would suspect that as the time interval gets farther and farther away from the period of time where the matter generating the pattern exists, the influence of an individual intellect pattern would become weaker and finally merge into the other patterns in the space-time matrix (shades of the Force!).

Although most of this speculation may be far from presently-known, hard scientific fact, that only indicates our present lack of scientific knowledge on the true nature of microscopic space-time and how it interacts with matter. However, at least in some limited way, the concept of our spirit as an entity containing our intellect, that is formed by our body, and yet is immaterial and

Inquisition/Robert L. Forward

immortal, and exists after the body is gone, cannot be arbitrarily dismissed as unscientific nonsense. Indeed, it may be that in the future, rather than denying the existence of the spirit, science will prove that the spirit *does* have a physical reality.

—G—

Opinion

[Continued from page 93]

like that—but they're too busy, I guess, changing a writer's commas to dashes and his dashes to commas to worry about real errors. And some of them, alas, figure that in a cockeyed science fiction novel any kind of cockeyed spelling is probably okay.

Delany, again: in his early novel, *Babel-17*, he named a space-pirate Jebel and called his giant spaceship *Jebel Tarik*, explaining that that means "Jebel's Mountain" in Old Moorish. Unfortunately, Delany got things turned around. "Jebel Tarik" means "Tarik's Mountain," Tarik being an eighteenth-century Arab general; we have corrupted the name of the place he conquered into "Gibraltar." When Delany solemnly tells us that "Tarik" means "mountain," and brings a character named "Jebel" on stage, we can smile indulgently at very young writer's error; but the trouble is that *Babel-17* is a science fiction book in which the underlying science is linguistics, and it becomes hard to trust the rest of the text once one stumbles across such an obvious mistake. *Falsus in uno, falsus in omnibus*. Writing is hard work, and sustaining the reader's illusion that what is on the page has really happened is the hardest part of all. When I encounter characters named Werhner or mountains belonging to Jebel, that illusion is punctured for me just as effectively as it is by references to Queen Victoria's Italian accent or weeks of rain in Los Angeles in summer. We have to try to get it straight—down to the pettiest detail.

—G—

Reviews

[Continued from page 86]

Valley. She is accompanied by B.B. (for "Baby Brother"), a violent-tempered, enthusiastic, lovable little faun whom she carries around on her back.

At first the adult was slightly put off by the tone, the overly matter-of-fact, didactic voice of the storyteller. But the child liked it—she usually preferred books with a narrative voice (rather than books which pretended to have written themselves) and found it useful to have interesting facts pointed out and unusual words explained in footnotes.

There is a dreamlike, almost mythic flow to Kit's adventures; my favorite is her encounter with the dragon Taliesin, one of the most haunting, original, and

evocative passages in the book. There is also a battle with some splendidly dreadful monsters; and an interlude with the Woman Warrior and her extended family of brave and noble women. Two well-known fairytales are also transfigured in *Kittatinny*: "The Little Mermaid" and "Sleeping Beauty." Russ's re-imagining of Sleeping Beauty's story carries a good deal more conviction than the original tale, as well as more horror. This is the *real* story of Sleeping Beauty.

There have been plenty of quest stories in which the protagonist struggles through various rites of passage to achieve understanding and selfhood, but most of them have been for and about men. When the adventurer is a woman, she usually learns such lessons as patience, humility, and love, and is then fit to go home and get married.

This doesn't happen in *Kittatinny*, but I didn't expect it to. I must admit I was shocked by what *does* happen.

After all her adventures, Kit returns home to discover that she is a grown woman, and no one except her friend Rose (last seen as a nervous, wimpy little girl scorned by Kit) has noticed her absence. Handsome Ondry Miller proposes marriage to Kit who then realizes that not only does she not care for him, but she is in love with Rose. Not just friendship-love—sexual love.

In a novel written for adults, such a conclusion would not have surprised me. In a fantasy written in language which makes it accessible even to fairly young children, it shook me. Call it heterosexist bias on my part, but I didn't expect it, and found it disturbing. Children today are more knowledgeable than I was as a child; after daily infusions of "Hollywood Squares," "All in the Family," "All My

Children," etc., they are doubtless more blasé about the various manifestations of sexuality than I am even now. But I'd slap a PG label on the book, at least, and warn the reader, or the reader's parents.

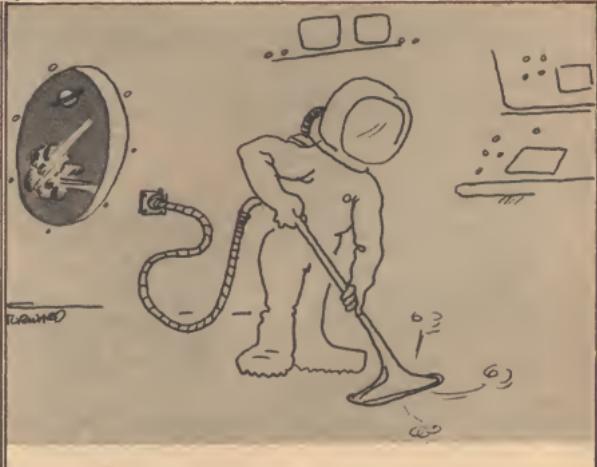
Another problem I had with the book was also in the conclusion (where all the symbols come home to roost) when B.B. is revealed as a grown woman.

B.B., of course, turns out to be a part of Kit, but as to why this masculine little creature has to become literally female in order to incorporate with Kit—well, perhaps Russ was simply tired of all those symbolic lists which divide the world in two with one side "female, dark, earth, intuition, emotion, passive" versus "male, light, sky, reason, thought, active," and wanted to show that Kit's animus (or Ego, or Other, or Soul) was not, as Jung would have it, male (just as a man's would be female), but every bit as female as her body.

But how? wonders the child. What happened to B.B.'s penis? Will my baby brother lose his penis and acquire a "tidy mound of hair" and breasts someday?

Kittatinny is a valuable, needed book in many ways, as well as being a delight to read. Adventurous little girls need an alternative to having to identify with the male hero to stay home, and some day, one hopes, *Kittatinny* will be one of many famous questing women. I have quarrels with the book, and I found it disturbing—but what worthwhile journey is not?

—G—



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Classified

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Star Chamber

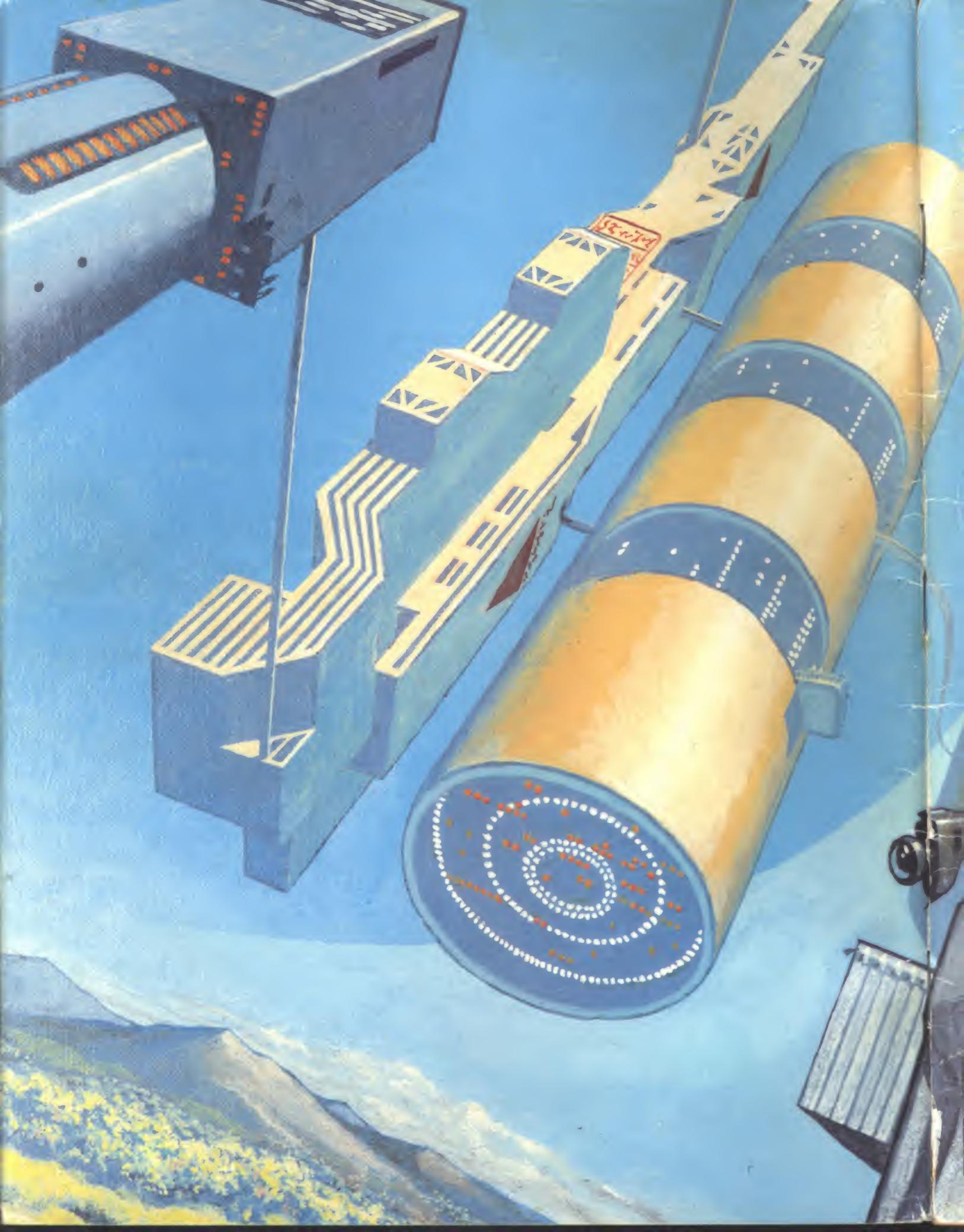
Edward Bryant



SCIENCE FICTION writers will grow just about anywhere, but it is still a little surprising to find one blooming on a cattle and sheep ranch in Wheatland, Wyoming. At the age of eight, Edward Bryant found that reading SF offered a mental escape from the ranch. And in writing it, he has since made good his physical escape; escape from working in a stirrup-buckle factory or announcing records on Wyoming radio stations. He has been publishing his science fiction for over ten years, but at 33 he still must be considered one of the foremost writers of the younger generation. He writes fiction characterized by the absence of telepathic dragons, mighty thewed barbarians, and Empire blockade runners. "I seem," he says modestly, "to be a minority writer in SF." And, indeed, his devoted followers know him as an author who cares more for texture than sales in his writing. Surreal settings, such as the city, Cinnabar, and outlandish characters, such as Tourmaline Hayes (the network sex star), are the hallmarks of his work. It is work which can be appreciated with or without an understanding of the highly literate (and frequently obscure) allusions which he scatters about. "Minority writer" doesn't describe him as well as "writer's writer," for he is the writer's writer of the new generation. This was confirmed when his short story, "Stone" (*The Magazine of Fantasy and Science Fiction*) won the Nebula this year. His work with even "younger" writers than himself (he founded the Denver and Colorado Springs SF Writers' Workshops) has nurtured such careers as those of Cynthia Felice and Connie Willis. He is excited about the direction of science fiction and describes the new generation as "literate writers who have a catholic grounding across the spectrum of both humanities and sciences." This generation in science fiction could not have a much better spokesman. —G—

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